EVALUATION AND SYSTEMS INTEGRATION OF PHYSICAL SECURITY BARRIER SYSTEMS

FINAL REPORT

MAY 1991

Prepared for the

Belvoir Research, Development, and Engineering Center
Fort Belvoir, VA 22060

By

Wackenhut Applied Technologies Center
10530 Rosehaven Street, Suite 500
Fairfax, VA 22060

Authorization for this research was under contract number DAAK70-88-D-0015, Task Order No. 0005 (Task Order to contract awarded on a competitive basis). The views, opinions, and/or findings contained in this report are those of the authors and should not be construed as an official Department of the Army position, policy, or decision, unless so designated by other documentation.

SECURITY CLASSIFICATION OF THIS PAGE

REPORT DOCUMENTATION PAGE

Form Approved OMB No. 0704-0188

1a. REPORT SECURITY CLASSIFICATION: Unclassified	1b. RESTRICTIVE MARKINGS
2a. SECURITY CLASSIFICATION AUTHORITY	3 DISTRIBUTION/AVAILABILITY OF REPORT: Unlimited
2b. DECLASSIFICATION/DOWNGRADING SCHEDULE	
4. PERFORMING ORGANIZATION REPORT NUMBER(S): DAAK70-88-D-0015, Task 0005	5. MONITORING ORGANIZATION REPORT NUMBER(S)
6a. NAME OF PERFORMING ORGANIZATION: Wackenhut Applied Technologies Center; 6b. OFFICE SYMBOL (If applicable)	7a. NAME OF MONITORING ORGANIZATION: DCMAO Baltimore
6c. ADDRESS (City, State, and ZIP Code): 10530 Rosehaven Street, Suite 500, Fairfax, VA 22030	7b. ADDRESS (City, State, and ZIP Code): 200 Towsontown Blvd., Towson, MD 21204
8a. NAME OF FUNDING/SPONSORING ORGANIZATION: Belvoir RD&E Center; 8b. OFFICE SYMBOL (If applicable): STRBE-TSO	9. PROCUREMENT INSTRUMENT IDENTIFICATION NUMBER: DAAK 70-88-D-0015, Task 0005
8c. ADDRESS (City, State, and ZIP Code): Fort Belvoir, VA 22060	10. SOURCE OF FUNDING NUMBERS: PROGRAM ELEMENT NO. / PROJECT NO. / TASK NO. / WORK UNIT ACCESSION NO.

11. TITLE (Include Security Classification)

Evaluation And Systems Integration Of Physical Security Barrier Systems

12. PERSONAL AUTHOR(S)

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13a. TYPE OF REPORT	13b. TIME COVERED	14. DATE OF REPORT (Year, Month, Day)	15. PAGE COUNT
Final	FROM 09/90 TO 05/91	91/05/30	

16. SUPPLEMENTARY NOTATION

17. COSATI CODES			18. SUBJECT TERMS (Continue on reverse if necessary and identify by block number)
FIELD	GROUP	SUB-GROUP	Physical Security Barriers Barrier Applications System Plan Of Action

19. ABSTRACT (Continue on reverse if necessary and identify by block number)

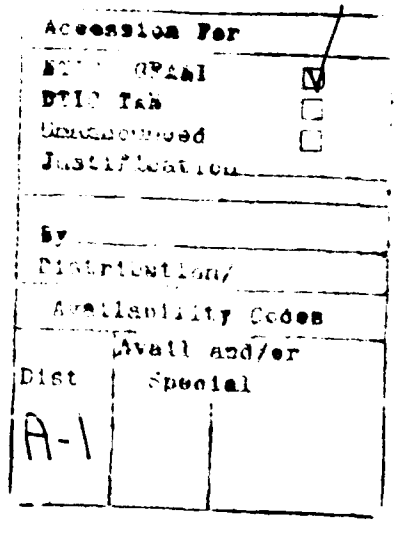
This study of physical security barrier systems encompassed a review of existing barrier systems, an analysis of the requirements for barrier components within a physical security system, identification of shortcomings, and development of potential R&D program areas to address those deficiencies. The objective of this effort was to identify barrier components needed to provide adequate physical security systems for securing and protecting US military personnel and equipment. To present an overview of military physical security barrier requirements to the community, to develop an understanding of the current state of the art for barrier components and systems, and to solicit ideas on how technology developed in the civilian sector might be applied to the military requirements, a survey/questionnaire for industry was prepared and distributed. As an integral part to the development of an action plan for overcoming deficiencies in current physical security barrier systems, a brainstorming session was held with selected Government representatives expert in the field of barrier systems. Supporting analyses prioritized and developed potential program efforts for the

20. DISTRIBUTION/AVAILABILITY OF ABSTRACT	21. ABSTRACT SECURITY CLASSIFICATION	
☒ UNCLASSIFIED/UNLIMITED ☐ SAME AS RPT ☐ DTIC USERS	Unclassified	
22a. NAME OF RESPONSIBLE INDIVIDUAL: Domingo Caro	22b. TELEPHONE (Include Area Code): (703) 664-2736	22c. OFFICE SYMBOL: STRBE-TSO

DD Form 1473, JUN 86 — Previous editions are obsolete. — SECURITY CLASSIFICATION OF THIS PAGE

19. Abrstract Cont.

resulting recommended DOD Barrier Applications System Plan of Action. Prioritized order for barrier program areas within the Plan of Action, include (1) Forced Entry, (2) Vehicle Approach, (3) Explosives, (4) Ballistics, and (5) Aerial Approach.



STUDY GIST

EVALUATION AND SYSTEMS INTEGRATION OF PHYSICAL SECURITY BARRIER SYSTEMS

1. PRINCIPAL FINDINGS

Prioritized order for barrier program areas within the DOD Barrier Applications System (BAS) Plan of Action, based on prioritization analysis, and potential R&D programs include:

Program Area	Potential R&D Program
Forced Entry	-Passive component upgrades (doors and window systems) -Active component development/integration (local area systems, wide area systems)
Vehicle Approach	-Movable (tactical) vehicle barriers -Unconventional vehicle barriers
Explosives	-Composite wall liners -Portable vented shielding -Pre-detonation of explosives
Ballistics	-Composite/synthetic armor upgrades
Aerial Approach	-Identified for further analysis

2. MAIN ASSUMPTIONS

The BAS program should focus on the intermediate and advanced threat levels as a basis for establishing component requirements. Full protection against the maximum threat in a peacetime, rear area protection, or low intensity conflict environment with physical barriers alone would not lead to affordable (cost effective) solutions. Greater reliance in that case would have to be placed on early detection and faster reaction forces.

3. PRINCIPAL LIMITATIONS

The Barrier Program as defined does not, as yet, specifically consider the rear area protection nor the low intensity conflict missions.

4. SCOPE OF THE EFFORT

This study of physical security barrier systems encompassed a review of existing barrier systems, an analysis of the requirements for the components within the system, identification of shortcomings, and development of potential R&D program areas to address those deficiencies.

5. OBJECTIVE

The objective of this effort was to identify barrier components that when integrated into DOD physical security systems provide adequate protection for US military personnel and equipment.

6. BASIC APPROACH

The initial step in this program effort was to establish a data base of physical security barrier components and to develop a listing of sources from both Government and Industry. To present an overview of military physical security barrier requirements to the community, to develop an understanding of the current state of the art for barrier components and systems, and to solicit ideas on how technology developed in the civilian sector might be applied to military requirements, a survey/questionnaire for industry was prepared and distributed. As an integral part to the development of an action plan for overcoming deficiencies in current physical security barrier systems, a brainstorming session was held with selected Government representatives expert in the field of barrier systems. Supporting analyses prioritized and developed potential program efforts for the resulting recommended Barrier Applications System Plan of Action.

7. REASON FOR PERFORMING THE STUDY

To assist the Product Manager for Physical Security Equipment in the analysis and development of a Barrier Applications System (BAS) Plan of Action.

8. IMPACT OF THE STUDY

The study effort aids PM-PSE in the allocation of development and procurement funds that are related to physical security barrier components.

9. SPONSOR

US Army Belvoir Research, Development and Engineering Center
US Army Product Manager, Physical Security Equipment

10. PRINCIPAL INVESTIGATOR

Champlin F. Buck, Wackenhut Applied Technologies Center

11. ADDRESS WHERE COMMENTS OR QUESTIONS CAN BE SENT

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Belvoir RD&E Center
ATTN: STRBE-JIS
Fort Belvoir, VA 22060

12. DTIC/DLSIE ACCESSION NUMBER OF FINAL REPORT

To be assigned.

FORWARD

This technical report is submitted to the US Army Belvoir Research, Development, and Engineering Center by Wackenhut Applied Technologies Center (WATC), 10530 Rosehaven Street (Suite 500), Fairfax, VA 22030. The report documents the effort performed under contract DAAK70-88-D-0015, Task 0005, to provide evaluation and systems integration of Physical Security Barrier Systems. The specified product, a recommended DOD Barrier Applications System Plan of Action, is presented at the Appendix A with supporting analyses at Appendix B.

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OVERVIEW

1.1 BACKGROUND

Even though the threat to critical military assets and personnel may change with the evolving world situation shifting from the probability of high intensity conflict to lower intensity actions, the requirement for security remains. Physical Security is that part of security concerned with measures designed to safeguard personnel; to prevent or delay unauthorized access to equipment, installations, material and documents; and to safeguard them against espionage, sabotage, damage, and theft.

Physical security barrier systems are required to augment security measures by providing intruder deterrence and delay. The nature and degree of the threat to critical military assets and personnel varies with respect to geographic locations, level of hostile intent, and vulnerability of the target. Targets range from personnel and equipment to nuclear and chemical materials. The threat can range from unskilled intruders to highly skilled radicals or foreign agents, depending on motivational intents.

Barriers are but one of the four elements which must interact in a timely manner to form the foundation for an effective physical security protection system. *Detection and Assessment* systems must detect and verify any unauthorized intrusion attempt by outsiders or any serious adverse acts by insiders or outsiders. *Delay* systems (barriers) must impede adversary penetration into, or exit from, the area being protected, or must provide shielding for the asset being protected from threat weapons and surveillance. *Response* systems, or forces, must counteract adversary activity and neutralize the threat. The only way to achieve denial of unauthorized access is through the application and integration of these major components of a physical security system. Each element is equally important and none of them can be eliminated or

compromised if effective physical protection is to be achieved. The focus of this effort however is on the *delay / protection* facet within the overall context of effective physical security systems.

1.2 OBJECTIVE

The objective of this effort was to identify barrier components that when integrated into DOD physical security systems provide adequate protection for US military personnel and equipment. Specifically to:

1.2.1 Identify the characteristics of physical security barrier components that can be employed to counter the threat.

1.2.2 Develop physical security barrier systems from the identified components to augment the Integrated Commercial Intrusion Detection System.

1.2.3 *Prepare a plan of action addressing shortfalls* and deficiencies of existing security barrier systems and recommend a direction for Research and Development efforts.

1.3 TECHNICAL APPROACH

1.3.1 The initial step in this program effort was to establish a data base of physical security barrier components and to develop listing of sources from both Government and Industry for hardware and expertise. Appendix C, List of Sources for Physical Security Barriers, provides a reference to documents applicable to the analysis of barrier components.

1.3.2 To present an overview of military physical security barrier requirements to the community, to develop an understanding of the current state of the art for barrier components and systems, and to solicit ideas on how technology developed in the civilian

sector might be applied to military requirements, a survey/ questionnaire for industry was prepared (Appendix D). In response to an announcement in the Commerce Business Daily, 28 firms requested and were sent the survey. Other companies known to be leaders in the physical barrier field were also selected and provided the survey material. Thirteen responded in detail with answers to the questionnaire. An analysis of responses to questions within each functional area was conducted. With the reorientation in program thrust discussed below, answers to individual questions provided insights into technology applications and were considered in the development potential R&D areas in the recommended DOD Barrier Applications System Plan of Action. An outline summary of the responses is at Appendix E.

1.3.3 As an integral part to the development of an action plan for overcoming deficiencies in current physical security barrier systems, a brainstorming session was held with selected Government representatives expert in the field of barrier systems. The objectives of the session were to elicit from the group what the performance standards for various barrier components should be in a DOD Barrier Applications Systems RDTE program, and to develop from their collective experience innovative ideas or approaches to address current shortfalls. Group discussions reoriented the program thrust from one based on functional areas to focussing on potential threat tactics, and approaching barrier requirements from that point of view. Of the nine methods of attack that evolved from the group, as shown in the Supporting Analyses for the DOD Barrier Applications System Plan of Action, Appendix B, two (covert/insider entry and airborne/waterborne attack) were considered to fall outside the scope of a barrier components program, mail/supplies bomb attack was incorporated into the explosive area, and consideration of waterside/underwater attack was deferred until after further review of service programs.

1.3.4 The Supporting Analyses for the DOD Barrier

Applications Program, Appendix B, present WATC's analytic efforts to prioritize and develop potential program efforts for the resulting recommended Plan of Action at Appendix A.

1.4 DOD BARRIER APPLICATIONS SYSTEM PROGRAM

In support of the objectives of the DoD Physical Security Equipment (PSE) program, the Product Manager for Physical Security Equipment, US Army Belvoir Research, Development and Engineering Center, Fort Belvoir, Virginia, has established the DOD Barrier Applications System (BAS) program. The purpose of this program is to identify active and passive barrier components needed to provide adequate physical security systems for securing and protecting US personnel and equipment, and where required, to initiate a plan of action addressing shortfalls and deficiencies of existing physical security barrier systems.

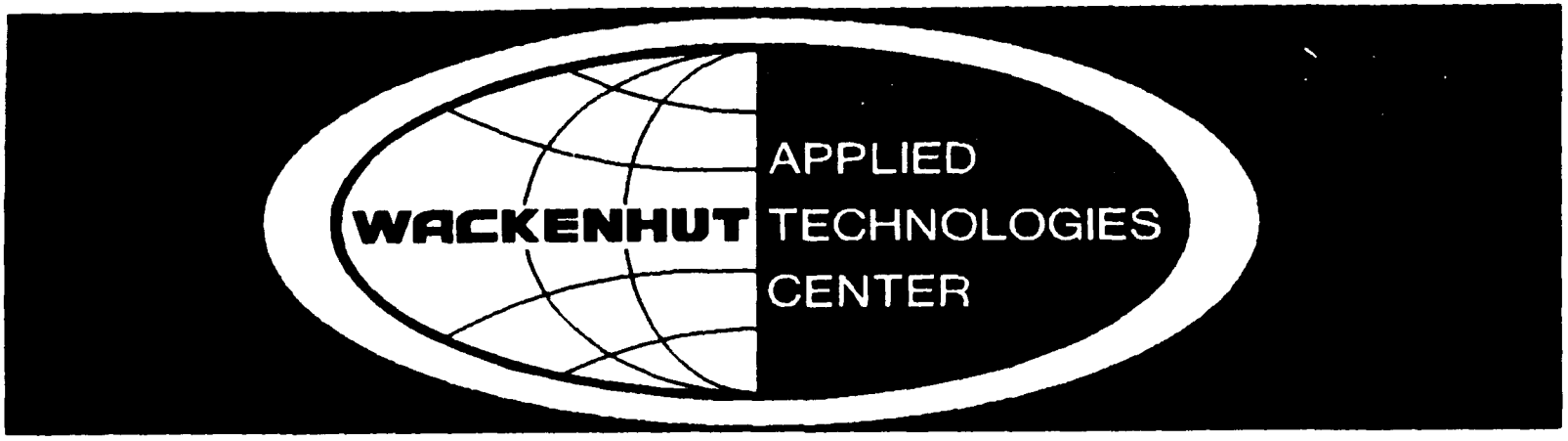
1.4.1 *The objectives of the BAS Plan of Action are:*

- to determine physical security barrier requirements.
- to identify shortcomings in current capabilities.
- to define RDTE efforts required to overcome identified deficiencies.
- to prioritize RDTE efforts.
- to define management structure.
- to establish Barrier Action Group membership.
- to establish technical review procedures.

1.4.2 The BAS Plan of Action is intended to be a dynamic document evolving as changes in requirements, technology, and available capability occur.

APPENDIX A

Recommended DOD Barrier Applications System Plan of Action, April 1991



A Subsidiary of THE WACKENHUT CORPORATION

PHYSICAL SECURITY BARRIER SYSTEM PLAN OF ACTION

FINAL REPORT

APRIL 30, 1991

10530 ROSEHAVEN STREET, SUITE 500, FAIRFAX, VA 22030 (703) 359-9000

DOD BARRIER APPLICATIONS SYSTEM
PLAN OF ACTION

U.S. Army Product Manager for
Physical Security Equipment
Fort Belvoir, Virginia 22060


DEPARTMENT OF DEFENSE
BARRIER APPLICATIONS SYSTEM

OUTLINE
PLAN OF ACTION

- BACKGROUND
- DOD BARRIER APPLICATIONS SYSTEM PLAN OF ACTION
- PROGRAM EMPHASIS
- SUPPORTING ANALYSES
  - PRIORITIZATION
  - FORCED ENTRY ANALYSIS
  - EXPLOSIVES ANALYSIS

PM-PSE MISSION

THE PRODUCT MANAGER FOR PHYSICAL SECURITY EQUIPMENT HAS DOD RESPONSIBILITY TO PERFORM MANAGEMENT, OPERATIONS, AND SUPPORT FUNCTIONS, INCLUDING THE RESPONSIBILITY FOR PROGRAMMING, BUDGETING, FUNDING, AND PUBLICATION OF STANDARDS, MILITARY SPECIFICATIONS, AND DESIGN AND PERFORMANCE CRITERIA FOR RESEARCH AND ENGINEERING OF:

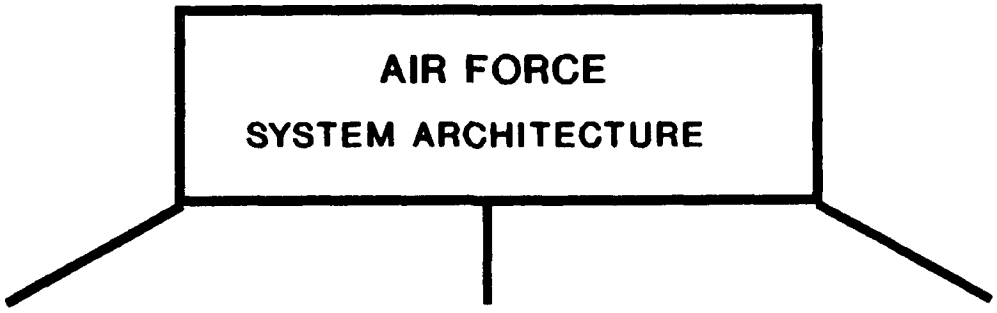
- INTERIOR PHYSICAL SECURITY EQUIPMENT,
- PHYSICAL SECURITY BARRIERS SYSTEMS,
- SECURITY LIGHTING SYSTEMS, AND

COMMAND, CONTROL AND DISPLAY, AND ROBOTIC SYSTEMS AS THEY APPLY TO THE ABOVE.

PM-PSE BARRIER MISSION

THE PRODUCT MANAGER FOR PHYSICAL SECURITY EQUIPMENT HAS DOD RESPONSIBILITY TO PERFORM MANAGEMENT, OPERATIONS, AND SUPPORT FUNCTIONS, INCLUDING THE RESPONSIBILITY FOR PROGRAMMING, BUDGETING, FUNDING, AND PUBLICATION OF STANDARDS, MILITARY SPECIFICATIONS, AND DESIGN AND PERFORMANCE CRITERIA FOR RESEARCH AND ENGINEERING OF *PHYSICAL SECURITY BARRIERS SYSTEMS,* AND COMMAND, CONTROL AND DISPLAY, AND ROBOTIC SYSTEMS AS THEY APPLY TO PHYSICAL SECURITY BARRIER SYSTEMS.

DOD PSE PROGRAM



ARMY

- INTERIOR PSE
- COMMAND, CONTROL AND DISPLAY SYSTEMS
- SECURITY LIGHTING
- FORCE PROTECTION SYSTEMS
- BARRIER SYSTEMS
- INTERIOR ROBOTICS

- EXTERIOR ROBOTICS

NAVY

- ANTI-COMPROMISE EMERGENCY DESTRUCT SYSTEMS
- SHIPBOARD AND
- WATERSIDE SECURITY SYSTEMS
- LOCKS
- UNDERWATER ROBOTICS

AIR FORCE

- EXTERIOR DETECTION
- EXTERIOR SURVEILLANCE
- ENTRY CONTROL SYSTEMS (INCLUDES BIOMETRIC IDENTIFIERS)

PHYSICAL SECURITY BARRIERS CENTERS OF EXPERTISE

PROGRAM MANAGEMENT	-	PRODUCT MANAGER, PHYSICAL SECURITY ATTN: AMC-PSE (MR. EDWARDS) BELVOIR RD&E CENTER FORT BELVOIR, VA 22060
ARMY REQUIREMENTS	-	COMMANDANT U.S. ARMY MILITARY POLICE SCHOOL ATTN: ATZN-MP-CM FT. MCCLELLAN, ALA. 23605-5030
NAVY REQUIREMENTS	-	COMMANDER NAVAL INVESTIGATIVE SERVICE COMMAND CODE: 24X24A WASHINGTON, D.C. 20388-5024
USAF REQUIREMENTS	-	HEADQUARTERS, AFOSP ATTN: SPPC (LTC KARST) KIRTLAND AFB, NM 87117-6001
SPECIAL WEAPONS	-	COMMANDER, USANC ATTN: MONA-SU (MAJ PRATER) 7500 BACKLICK ROAD, BLDG. 2073 SPRINGFIELD, VA 22150-3198
SYSTEM DESIGN	-	CORPS OF ENGINEERS 215 NORTH 17TH STREET ATTN: CEMROED-S (MR. TROUT) OMAHA, NEB. 68102-4978
ACTIVE BARRIERS	-	COMMANDER, USA ARDEC ATTN: SMCAR-FSN-T (MR. WORTH) PICATINNY ARSENAL, NJ 07806-5000
ADVERSARY EVALUATION	-	HQ, USASFC (A) AOSO-CG-O ATTN: SPECIAL PROJECTS (MSG GUNNETT) FT BRAGG, NC 28307-5206

PROPOSED
BARRIER ACTION GROUP

JERRY EDWARDS	PM-PSE*	703-664-2883
LTC JOE KARST	AFSOP**	505-844-9615
BOB LEEK	NISC**	202-433-9143
CPT DAN ZANKL	USAMPS**	205-848-3016
RICHARD BONICH	BRDEC	703-664-6502
MSG BILL GUNNETT	1ST SOCOM	919-396-8432
MAJ TIM PRATER	USANCA	703-355-7263
JOHN TROUT	USACE	402-221-3151
LTC BOB WALKER	HQAMC	703-274-9454
ROBERT WORTH	ARDEC	201-724-3213
MARTY VITCH	AMC SSD	404-363-5543

* BARRIER APPLICATIONS SYSTEM CHAIR
** JOINT SERVICE REPRESENTATIVES

BAS PLAN OF ACTION
OBJECTIVES

- TO DETERMINE PHYSICAL SECURITY BARRIER REQUIREMENTS
- TO IDENTIFY SHORTCOMINGS IN CURRENT CAPABILITIES
- TO DEFINE RDTE EFFORTS REQUIRED TO OVERCOME IDENTIFIED DEFICIENCIES
- TO PRIORITIZE RDTE EFFORTS
- TO DEFINE MANAGEMENT STRUCTURE
- TO ESTABLISH BARRIER ACTION GROUP MEMBERSHIP
- TO ESTABLISH TECHNICAL REVIEW PROCEDURES

DEFINITIONS

PHYSICAL SECURITY SYSTEM

DETECTION, ASSESSMENT, DELAY, AND RESPONSE

BARRIER SYSTEM

DELAY AND PROTECTION

AREAS OF INTEREST

PEACETIME, REAR AREA PROTECTION, AND LOW INTENSITY CONFLICT

DEFINITION OF THREAT

THREAT LEVEL	THREAT DESCRIPTION	LIKELY THREAT TYPES
Basic	Outsiders alone or in groups; insiders working alone or in association with other insiders.	Casual intruders; less radical demonstration groups; pilferers/thieves.
Intermediate	Outsiders, alone or in small groups; insiders working alone; intruder with some knowledge or familiarity with the security system.	Well-organized, radical, and violent demonstrations; organized crime; white collar crime; lower level espionage agents and stand-off surveillance; some terrorists.
Advanced	Outsiders working alone or in collusion with an insider; knowledgeable, skilled or semi-skilled intruders without penetration aids.	Sophisticated espionage; some terrorists; paramilitary forces; highly organized and skilled criminal elements.
Maximum	Outsiders in well organized and trained groups working alone or with assistance from insiders; knowledgeable, skilled, and well equipped intruders who can use sophisticated and portable penetration aids.	Special purpose forces; some terrorist and paramilitary elements; highly trained or sophisticated espionage agents and methods

PRIORITIZED ORDER FOR BARRIER PROGRAM AREAS[1]

- FORCED ENTRY
- VEHICLE APPROACH
- EXPLOSIVES
- BALLISTICS
- AERIAL APPROACH

1. LISTED IN ORDER OF IMPORTANCE BASED ON PRIORITIZATION ANALYSIS.

DEFINITION OF PROGRAM AREAS

FORCED ENTRY

PROVIDE ACCEPTABLE
DELAY TIMES TO
ALLOW INTERCEPT

EXPLOSIVES

NO PENETRATION/
NO SPALLING
- CAR BOMB
- MAN CARRIED CHARGE
- MAIL BOMB

VEHICLE APPROACH

STOP VEHICLE APPROACHING
AT HIGH SPEEDS

BALLISTICS

DEFEAT >7.62mm
W/ NO SPALLING

AERIAL APPROACH

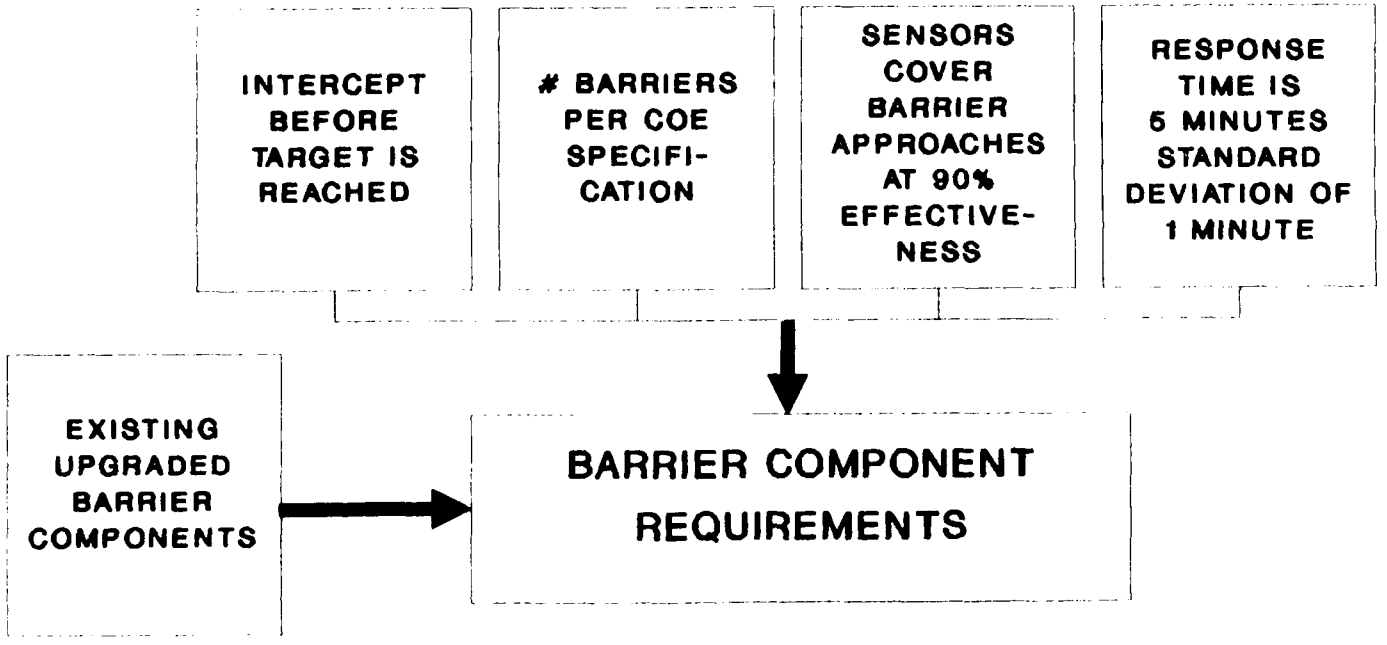
PREVENT AIRCRAFT/
PERSONNEL FROM
LANDING

BARRIER APPLICATIONS SYSTEMS OVERVIEW

- FORCED ENTRY
  - PASSIVE BARRIER UPGRADES
    - UPGRADE DOORS
    - UPGRADE WINDOWS
  - ACTIVE BARRIER AUGMENTATION OF PASSIVE SYSTEM
    - STICKY FOAM
    - TBD
- VEHICLE APPROACH
  - MOVABLE (TACTICAL) VEHICLE BARRIERS
  - UNCONVENTIONAL VEHICLE BARRIERS
- EXPLOSIVES
  - COMPOSITE WALL LINERS
  - PORTABLE VENTED SHIELDING
  - PRE-DETONATION OF EXPLOSIVES
- BALLISTICS
  - COMPOSITE/SYNTHETIC ARMOR
- AERIAL APPROACH
  - TBD
- SERVICE PROGRAMS
  - STICKY FOAM PROGRAM
  - ADVANCED WATERSIDE PROGRAM
  - BARRIER GAUNTLET

FORCED ENTRY

FORCED ENTRY ANALYSIS
ASSUMPTIONS



FORCED ENTRY
COMPONENT REQUIREMENT DEFINITION

THREAT [1,2]	BARRIER PROFILE [2]	PROTECTION LEVELS [2]
ADVANCED (with and without explosive tools)	EXTERIOR ONLY	LOW 50-65%
	EXTERIOR + ONE	MEDIUM 66-80%
	EXTERIOR + TWO	HIGH 81-95%
		VERY HIGH 96-100%

ANALYSIS ASSUMPTIONS

SENSOR PERFORMANCE

- SENSORS PERFORM AT 90 %
- ONE SENSOR SYSTEM COVERING EACH BARRIER OR BARRIER APPROACH

RESPONSE TIME

- MEAN VALUE = 5 MINUTES
- STAND. DEV. = 1 MINUTE

  EARLIEST = 2 MINUTES
  LATEST = 8 MINUTES

1. Threat as defined in Threat Statement for Army Materiel Command, 1989.
2. Tools profiles, barrier profiles, and protection levels as described in Corps of Engineers Security Handbook
3. Barrier component performance estimates from Sandia Barrier Technology Handbook

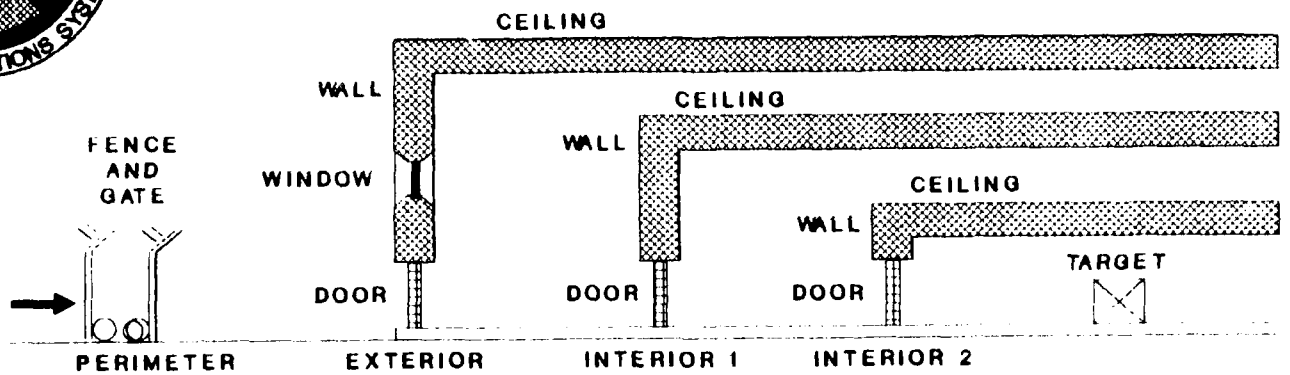
SCOPE OF FORCED ENTRY
ANALYSIS PARAMETERS

- ADVANCED THREAT
  - WITHOUT EXPLOSIVE TOOLS
  - WITH EXPLOSIVE TOOLS
- PROTECTION LEVEL
  - MEDIUM PROTECTION
  - HIGH AND VERY HIGH PROTECTION
- BARRIER SYSTEM CONFIGURATION
  - ONE PERIMETER BARRIER
  - ALL NON-EXTERIOR BARRIERS ARE INSIDE

DEFINITION OF EXPLOSIVE TOOLS

EXPLOSIVES USED SPECIFICALLY TO BREACH AN OBSTACLE OR BARRIER, NOT USED AS A WEAPON. INCLUDES PRE-PACKAGED BULK EXPLOSIVES, MOLDABLE FORMS, CONICAL AND LINEAR SHAPED CHARGES, ETC.

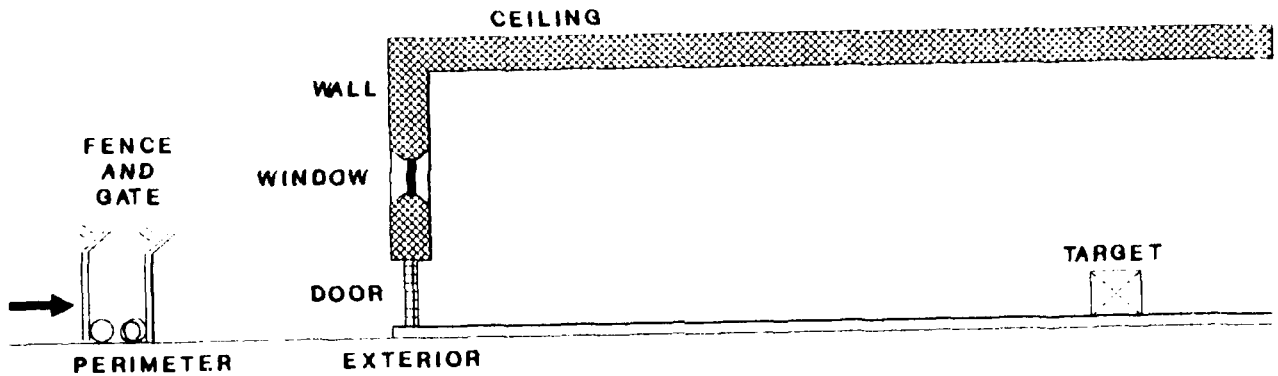
ASSESSMENT SITUATION
BASE CASE



DESCRIPTION OF BARRIER COMPONENTS

- 2 SEVEN FT FENCES AND BARBED TAPE, 100 FT BETWEEN
- GATE, 4X8' CHAIN LINK-PIPE WITH 11 GAUGE X 2" MESH ON 1.9" METAL PIPE FRAME, CHAINED AND PADLOCKED
- EXTERIOR WALL, CONCRETE BLOCK 8" THICK, REINFORCED
- WINDOW WITH STEEL MESH OVER 1/8" GLASS IN METAL SECURITY SASH, SMALLER THAN MAN-SIZED PANES
- DOOR, STANDARD INDUSTRIAL PEDESTRIAN WITH 16-GAUGE METAL, PANIC HARDWARE-MORTISE, CYLINDER LOCK, BUTT HINGES WITH NON-REMOVABLE PINS, FRONT PRY STRIP, HINGE Z STRIP, PANIC BAR PLATE
- INTERIOR WALL, 3/8" GYPSUM ON EACH SIDE OF 2X4 STUDS, 3.6" STEEL STUDS WITH 1/8" STEEL PLATE WELDED ON BACK
- CEILING, PLASTER LATH CEILING ON GYPSUM BOARD ATTACHED TO BOTTOM OF 4" CONCRETE FLOOR WITH 6X6" NO. 10 WIRE MESH

ASSESSMENT SITUATION
MEDIUM PROTECTION LEVEL
EXTERIOR + FENCE



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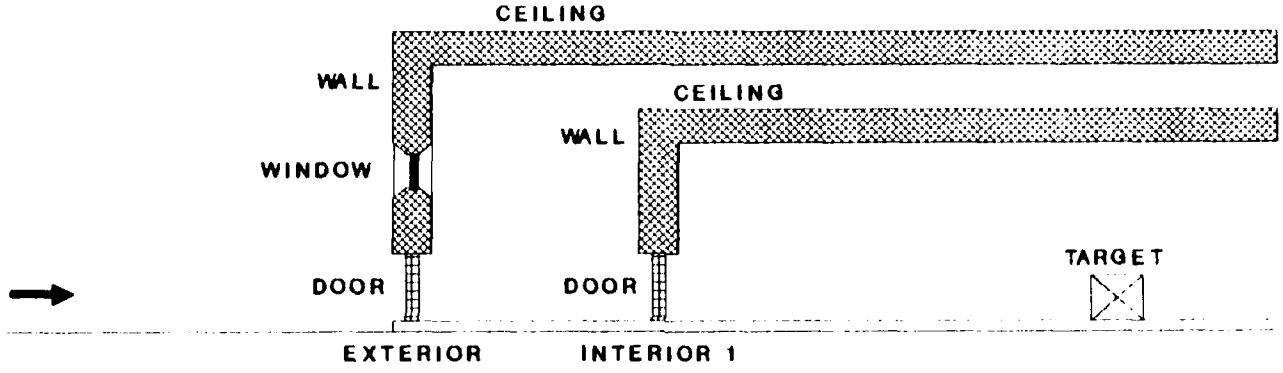
ASSESSMENT SITUATION
MEDIUM PROTECTION LEVEL
EXTERIOR + INTERIOR



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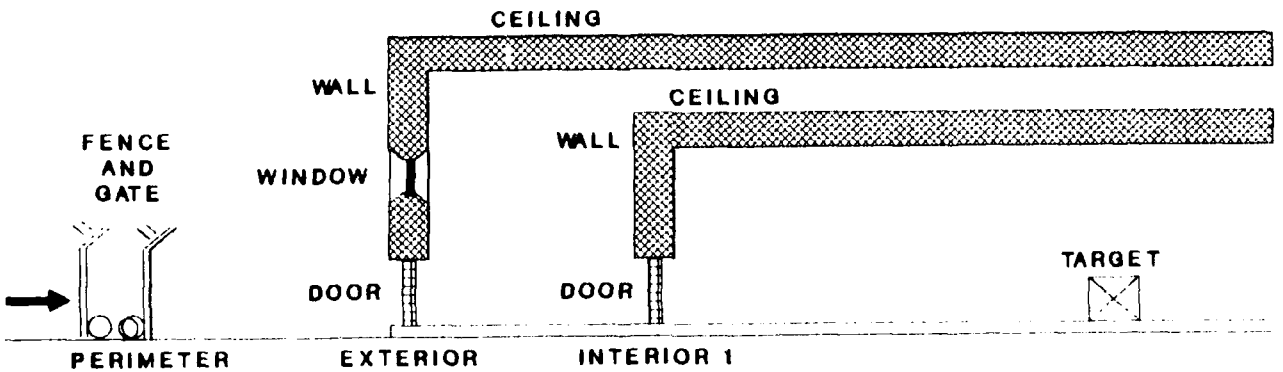
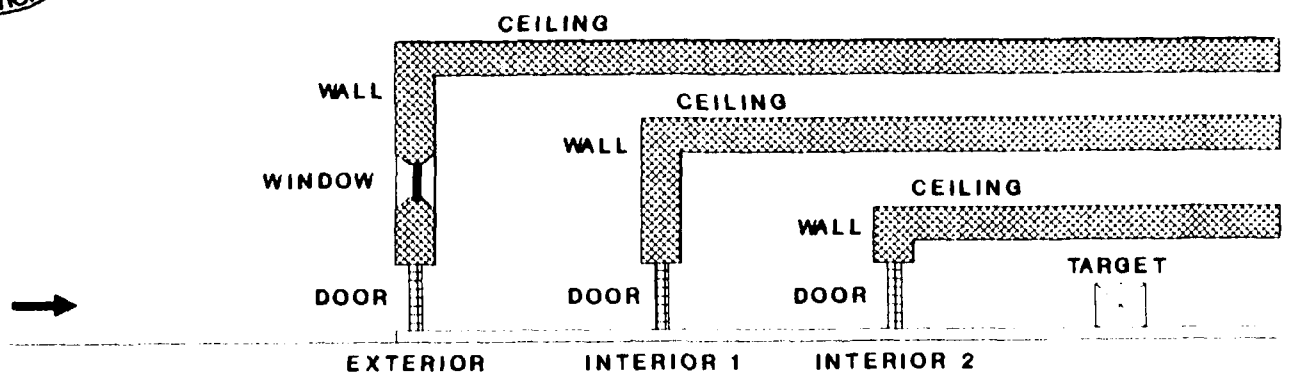
ASSESSMENT SITUATION
HIGH/VERY HIGH PROTECTION LEVEL
EXTERIOR + INTERIOR + FENCE



DESCRIPTION OF BARRIER COMPONENTS

- 2 SEVEN FT FENCES AND BARBED TAPE, 100 FT BETWEEN
- GATE, 4X8' CHAIN LINK-PIPE WITH 11 GAUGE X 2" MESH ON 1.9" METAL PIPE FRAME, CHAINED AND PADLOCKED
- EXTERIOR WALL, CONCRETE BLOCK 8" THICK, REINFORCED
- WINDOW WITH STEEL MESH OVER 1/8" GLASS IN METAL SECURITY SASH, SMALLER THAN MAN-SIZED PANES
- DOOR, STANDARD INDUSTRIAL PEDESTRIAN WITH 16-GAUGE METAL, PANIC HARDWARE-MORTISE, CYLINDER LOCK, BUTT HINGES WITH NON-REMOVABLE PINS, FRONT PRY STRIP, HINGE Z STRIP, PANIC BAR PLATE
- INTERIOR WALL, 3/8" GYPSUM ON EACH SIDE OF 2X4 STUDS, 3.6" STEEL STUDS WITH 1/8" STEEL PLATE WELDED ON BACK
- CEILING, PLASTER LATH CEILING ON GYPSUM BOARD ATTACHED TO BOTTOM OF 4" CONCRETE FLOOR WITH 6X6" NO. 10 WIRE MESH

ASSESSMENT SITUATION
HIGH/VERY HIGH PROTECTION LEVEL
EXTERIOR + TWO INTERIORS



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CASE DEFINITIONS FOR FORCED ENTRY ANALYSIS

BARRIER OPTIONS	PROTECTION LEVELS			
	MEDIUM		HIGH/ VERY HIGH	
	CONFIG. #1	CONFIG. #2	CONFIG. #1	CONFIG. #2
PERIMETER	*		*	
EXTERIOR	*	*	*	*
INTERIOR 1		*	*	*
INTERIOR 2				*

FORCED ENTRY

POTENTIAL R&D PROGRAM(S)

- FIXED SITE PHYSICAL SECURITY BARRIER COMPONENTS

  PASSIVE BARRIER COMPONENT UPGRADES
  - DOORS
  - WINDOWS

  ACTIVE BARRIER COMPONENT DEVELOPMENT/INTEGRATION
  - LOCAL AREA BARRIER SYSTEM
  - WIDE AREA BARRIER SYSTEM

- MOBILE SITE PHYSICAL SECURITY BARRIER COMPONENTS

FORCED ENTRY PROGRAM ELEMENTS PERFORMANCE REQUIREMENTS (MINUTES)

	THREAT TOOL KIT	
	Requirement W/O Explosive Tools	Available W/ Explosive Tools
WINDOW	2.8	1.0 (△ = -1.8) *
DOOR	2.8	0.8 (△ = -2.0)*
WALL	N/A	1.0 (△ = -1.8) *
ACTIVE	?	-2.0 *

* -2.0 minute additional delay required for each barrier when explosive tools are used

VEHICLE APPROACH

VEHICLE APPROACH CONSIDERATIONS

- IF SUFFICIENT CONSTRUCTION SPACE AND OFFSET DISTANCE ARE AVAILABLE, CURRENT BARRIER COMPONENTS ARE AVAILABLE TO STOP A 15,000 POUND VEHICLE TRAVELING AT 50 MPH.

- UNCONVENTIONAL OFF ROAD AND TRACKED VEHICLES ARE AVAILABLE TO THE THREAT THAT CAN DEFEAT TODAY'S BARRIER SYSTEMS.

- TRANSITORY NATURE OF DEPLOYMENT OF US PERSONNEL AND MATERIEL MANDATE RAPID INSTALLATION AND CHANGE OF MOVABLE VEHICLE BARRIERS.

- MOVABLE BARRIER COMPONENTS CAN BE USED TO AUGMENT EXISTING SYSTEMS THAT DO NOT MEET CURRENT REQUIREMENTS.

VEHICLE APPROACH
POTENTIAL R&D PROGRAMS

- MOVABLE (TACTICAL) VEHICLE BARRIERS
- UNCONVENTIONAL VEHICLE BARRIERS

VEHICLE APPROACH
MOVABLE (TACTICAL) VEHICLE BARRIERS

MOVABLE (TACTICAL) VEHICLE BARRIERS IS A DEVELOPMENT AND HARDWARE INTEGRATION PROGRAM WHICH PROVIDES PORTABLE BARRIER COMPONENTS TO AUGMENT EXISTING SYSTEMS, AND FOR RAPID INSTALLATION IN TRANSIENT SITUATIONS WHERE SECURITY AGAINST VEHICLE APPROACH IS REQUIRED.

POTENTIAL COMPONENTS MIGHT INCLUDE "PASSIVE/ ACTIVE" TRUSS SECTIONS LINKED TOGETHER TO FORM A PASSIVE VEHICLE BARRIER THAT WILL ROTATE WHEN STRUCK WITH SUFFICIENT FORCE TO FURTHER DISABLE THE APPROACHING VEHICLE. TRUSS SECTIONS MUST BE CAPABLE OF JOINING WITH CRASH GATES. GATES SHOULD BE FIRMLY GROUNDED TO ROADWAYS AND YET NOT IMPEDE THE FLOW OF NORMAL TRAFFIC.

VEHICLE APPROACH
UNCONVENTIONAL VEHICLE BARRIERS

UNCONVENTIONAL VEHICLE BARRIERS IS AN ANALYSIS AND RDTE PROGRAM REQUIRED TO IDENTIFY BARRIER COMPONENTS CAPABLE OF STOPPING UNCONVENTIONAL VEHICLES SUCH AS ROUGH TERRAIN VEHICLES WITH OVERSIZED TIRES OR TRACKED VEHICLES. ANALYSIS IS REQUIRED TO DETERMINE THREAT VEHICLE DYNAMICS TO SERVE AS A BASIS FOR DEVELOPMENT OF TECHNIQUES TO STOP OR DISABLE THE VEHICLE.

EXPLOSIVES

EXPLOSIVES PROGRAM CONSIDERATIONS

- VULNERABILITY OF HIGH VALUE U.S. ASSETS REQUIRE PROTECTION AGAINST TRUCK BOMBS, MAN PORTABLE CHARGES AND MAIL BOMBS.
- FIRST LINE OF DEFENSE AGAINST EXPLOSIVE ATTACK IS TO REDUCE THE THREAT'S ABILITY TO PLACE CHARGES AT HIS TARGET. THIS IS ACCOMPLISHED BY UPGRADING PERIMETER AND FORCED ENTRY BARRIERS, IMPROVING DETECTION SYSTEMS AND PROCEDURES, AND RELOCATION OF ASSETS WITHIN THE PHYSICAL SECURITY SYSTEM. REDUCED THREAT MIGHT ALSO BE ACCOMPLISHED BY CAUSING EARLY DETONATION OF EXPLOSIVES.
- THE EFFECTS OF EXPLOSIVE ATTACK CAN BE REDUCED BY THE INSTALLATION OF INTERMEDIATE PROTECTIVE WALLS OR REVETMENTS; UPGRADING THE BLAST RESISTANCE OF WALLS, DOORS AND WINDOWS; AND PROVISION OF VENTED PROTECTIVE SHIELDS AND SHUTTERS, AND EOD CONTAINERS.

EXPLOSIVES
POTENTIAL R&D AREAS

COMPOSITE WALL LINERS

PORTABLE VENTED SHIELDING

PRE-DETONATION OF EXPLOSIVES

EXPLOSIVES
COMPOSITE WALL LINERS

COMPOSITE WALL LINERS IS A DEVELOPMENT PROGRAM DESIGNED TO IDENTIFY INTERIOR WALL COVERINGS AND MOUNTING METHODS TO ABSORB THE EFFECTS OF EXPLOSIVES. THE SYSTEM WOULD MAXIMIZE THE ATTENUATION EFFECTS OF DISCONTINUITIES IN BLAST WALLS, AND THE STRENGTH OF COMPOSITE MATERIALS TO ABSORB SHOCK AND CONTAIN SPALLING. THE OBJECTIVE OF THE PROGRAM IS TO PROVIDE A *REASONABLY PRICED* RETROFIT WALL SUPPLEMENT WITH *LOWER WEIGHT* THAN EQUIVALENT PROTECTION WITH ARMOR PLATE OR BULK CONSTRUCTION MATERIALS.

EXPLOSIVES
PORTABLE VENTED SHIELDING

PORTABLE VENTED SHIELDING IS A DEVELOPMENT AND EVALUATION PROGRAM TO DESIGN/IDENTIFY BARRIER COMPONENTS AND TIE DOWN REQUIREMENTS TO PROVIDE SHIELDING/ATTENUATION OF EXPLOSIVE EFFECTS FROM TERRORIST ATTACK. THE PURPOSE OF INTERMEDIATE SHIELDING BETWEEN THE POINT OF DETONATION AND THE ASSET BEING PROTECTED IS TO BREAK UP THE BLAST WAVE AND REDUCE OVER-PRESSURIZATION AT THE TARGET. *BARRIERS MAY BE SACRIFICIAL BUT SHOULD NOT PROVIDE SECONDARY MISSILES.*

EXPLOSIVES
PRE-DETONATION OF EXPLOSIVES

BASIC RESEARCH IS REQUIRED TO DEVELOP MEANS TO CAUSE EARLY DETONATION, OR SUBCRITICAL BURNING, OF EXPLOSIVES BEING USED BY THREAT ELEMENTS AGAINST U.S. MILITARY PERSONNEL AND EQUIPMENT. POTENTIAL SOLUTIONS COULD VARY FROM STAND-OFF SYSTEMS TO DEFEAT EXPLOSIVES BEFORE THEY ARRIVE AT THE TARGET OR "PORTAL" SYSTEMS THAT CAUSE EXPLOSIVE BREAKDOWN AS IT PASSES THROUGH THE DEVICE. INNOCENT THIRD PARTY SAFETY IS A CONSTRAINT IN ALL SOLUTIONS.

BALLISTICS

BALLISTICS PROGRAM CONSIDERATIONS

- FUNDAMENTAL MEANS TO PROVIDE BALLISTIC PROTECTION IS TO DENY DIRECT ACCESS TO TARGET (i.e. BLOCKING SIGHTLINES) WITH WALLS, SHUTTERS, LOUVERS, ETC.
- PROTECTION AGAINST 7.62mm BALL AMMUNITION IS ACHIEVABLE WITH SIX INCH MASONARY WALL, 7/16 INCH ARMOR PLATE AND 1 1/8 INCH BULLET RESISTANT FIBERGLASS.
- VULNERABILITY OF U.S. PERSONNEL AND MATERIEL ASSETS REQUIRE BALLISTIC PROTECTIVE MEASURES AGAINST 7.62mm ARMOR PIERCING AND HIGHER THREATS.

BALLISTICS
COMPOSITE / SYNTHETIC ARMOR

COMPOSITE/SYNTHETIC ARMOR IS A RESEARCH AND DEVELOPMENT PROGRAM TO PROVIDE PROTECTIVE MATERIALS CAPABLE OF DEFEATING A BALLISTICS THREAT UP TO THE SOVIET 14.5mm HEAVY MACHINE GUN ROUND. (AN INTERMEDIATE GOAL OF THE U.S. .50 CALIBER ROUND IS ALSO REQUIRED). COMPOSITE/SYNTHETIC ARMORS ARE REQUIRED FOR BODY ARMOR, COMMERCIAL VEHICLE ARMOR KITS, PROTECTIVE SHIELDS/BLANKETS FOR HIGH VALUE MATERIEL, AND BARRIER SCREENS.

AERIAL APPROACH

AERIAL APPROACH PROGRAM CONSIDERATIONS

- VERSATILITY AND AVAILABILITY OF HELICOPTERS POSE THE MOST SERIOUS THREAT FOR AERIAL APPROACH
- UNRESTRICTED AIR SPACE COMPOUNDS THE PROBLEM OF EARLY DETECTION AND RESPONSE TO AERIAL APPROACH
- HI-LO PARACHUTING TECHNIQUES AND ULTRALIGHT AIRCRAFT PROVIDE TRULY COVERT ENTRY MEANS
- AERIAL APPROACH IS PRIMARILY A MILITARY PROBLEM WITH LITTLE OR NO CIVILIAN COUNTER PART PROGRAM TO PROVIDE COMMERCIAL INCENTIVE FOR RESEARCH AND DEVELOPMENT
- THREAT CAPABILITY AND MILITARY SITE REQUIREMENTS REQUIRE DEFINITION TO ADEQUATELY SUPPORT RDTE EFFORTS

SERVICE PROGRAMS

SERVICE PROGRAM EFFORTS

ARMY	- STICKY FOAM	- ON GOING
	- WEAPONS ACCESS DELAY SYSTEM (WADS)	- ON GOING
NAVY	- BASIC WATERSIDE PROGRAM ($1K/FT)	- 1987
	- ADVANCED WATERSIDE PROGRAM	- FY 93
USAF	- BARRIER GAUNTLET	- ON GOING

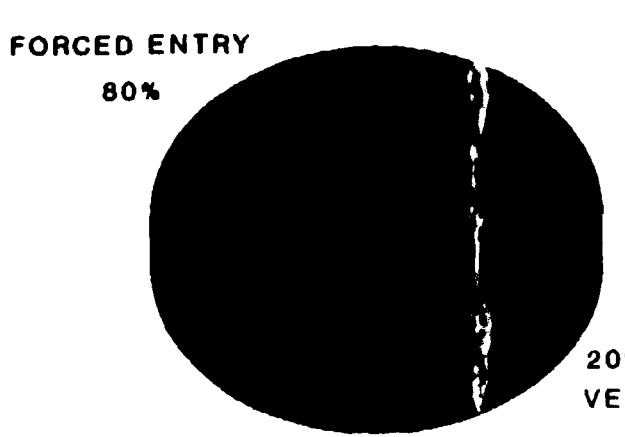
PROGRAM MANAGEMENT SUPPORT

PROGRAM MANAGEMENT EFFORTS

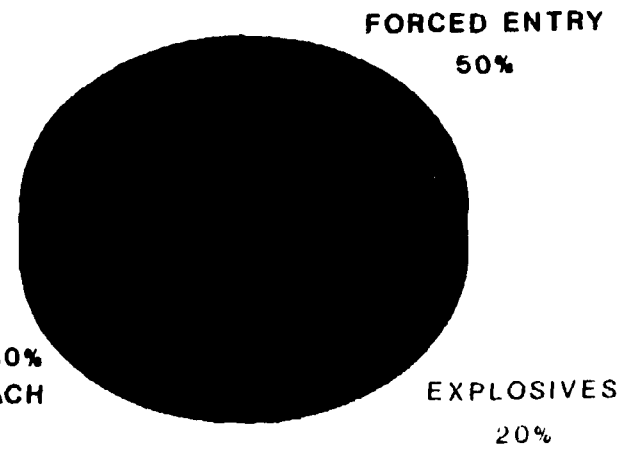
- PROGRAM DOCUMENTATION
- BRIEFING PACKAGES
- PROGRAM PLAN UPDATES
- SCHEDULING
- ANALYSES OF USER REQUIREMENTS
- MODELING SUPPORT

PROGRAM EMPHASIS

PROGRAM EMPHASIS
PERCENT OF PROGRAM



FY 1991
$500K



FY 1992
$1,000K

Based upon assumed funding levels and program area priorities.

INVITATION TO PARTICIPATE

PRODUCT MANAGER, PHYSICAL SECURITY EQUIPMENT

ATTN: AMC-PSE (MR. EDWARDS)

BELVOIR RD&E CENTER

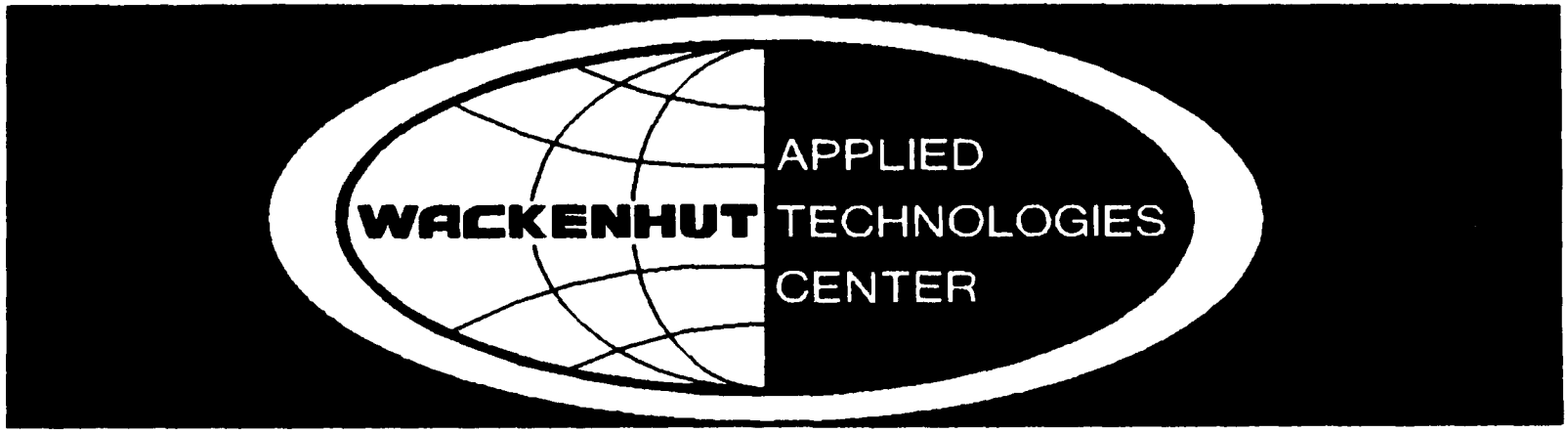
FORT BELVOIR, VA 22060

RECOMMENDATIONS TO BETTER DEFINE THE BARRIER APPLICATIONS SYSTEM PROGRAM

- BRIEF KEY PLAYERS IN OTHER SERVICES
- REFINE ORIGINAL SURVEY TO REFLECT BAS PROGRAM REQUIREMENTS AS CURRENTLY ENVISIONED AND REQUEST INFORMATION FROM PROMISING PARTICIPANTS IN THE ORIGINAL SURVEY
- PERFORM A REQUIREMENTS ANALYSIS TAILORED TO THE TACTICAL BARRIER APPLICATION
- DEVELOPMENT OF A SET OF ACTIVE BARRIER CONCEPTS
- REFINEMENT OF THE AERIAL APPROACH PROBLEM DEFINITION AND BARRIER REQUIREMENTS
- VERIFY INTERIOR BLAST DATA BASED UPON OTHER THEORETICAL BLAST PHENOMENOLOGY DATA
- DEFINE RDTE WORK PACKAGES AND FUNDING REQUIREMENTS
- DEVELOP A WIDE RANGE OF PROGRAM MANAGEMENT DOCUMENTATION AND REQUIREMENTS DOCUMENTS

APPENDIX B

Supporting Analyses for DOD Barrier Applications
System Plan of Acton



A Subsidiary of THE WACKENHUT CORPORATION

PHYSICAL SECURITY BARRIER SYSTEM SUPPORTING ANALYSIS

APRIL 30, 1991

10530 ROSEHAVEN STREET, SUITE 500, FAIRFAX, VA 22030 (703) 359-9000

PRIORITIZATION OF PROGRAM AREAS

POTENTIAL PROGRAM AREAS [1]

- VEHICLE APPROACH
- AERIAL APPROACH
- EXPLOSIVES
- BALLISTICS
- FORCED ENTRY
- COVERT ENTRY
- MAIL/SUPPLY BOMB
- AIR/WATER CONTAMINATION
- WATERSIDE/UNDERWATER ATTACK

1. Program Areas Identified, 2/14/91, By Physical Security Experts

DEFINITION OF POTENTIAL PROGRAM AREAS

VEHICLE APPROACH

STOP 15,000# VEHICLE APPROACHING AT 50mph

AERIAL APPROACH

PREVENT AIRCRAFT/ PERSONNEL FROM LANDING

EXPLOSIVES

NO PENETRATION/ NO SPALLING
- 2000# CAR BOMB
- 50# SATCHEL CHARGE

BALLISTICS

DEFEAT >7.62mm W/ NO SPALLING

FORCED ENTRY

PROVIDE ACCEPTABLE DELAY TIMES TO ALLOW INTERCEPT

COVERT ENTRY/INSIDER

SECURITY DERIVED FROM ACCESS CONTROL SYSTEM - DOES NOT INVOLVE BARRIER RQMTS.

MIAL/SUPPLY BOMB

DETECT, CONTAIN, OR SHIELD AND VENT
- 50# SUPPLY BOMB
- 2# MAIL BOMB

AIR/WATER CONTAMINATION

DENY ACCESS TO AIR AND WATER SUPPLY SYSTEMS; FILTER OUT CONTAMINATES

WATERSIDE/UNDERWATER

STOP SPEEDING CRAFT RUNNING AT 30 KNOTS AND CARRYING 2000# EXPLOSIVES

POTENTIAL PROGRAM AREAS [1]

FIRST LEVEL CONSIDERATIONS

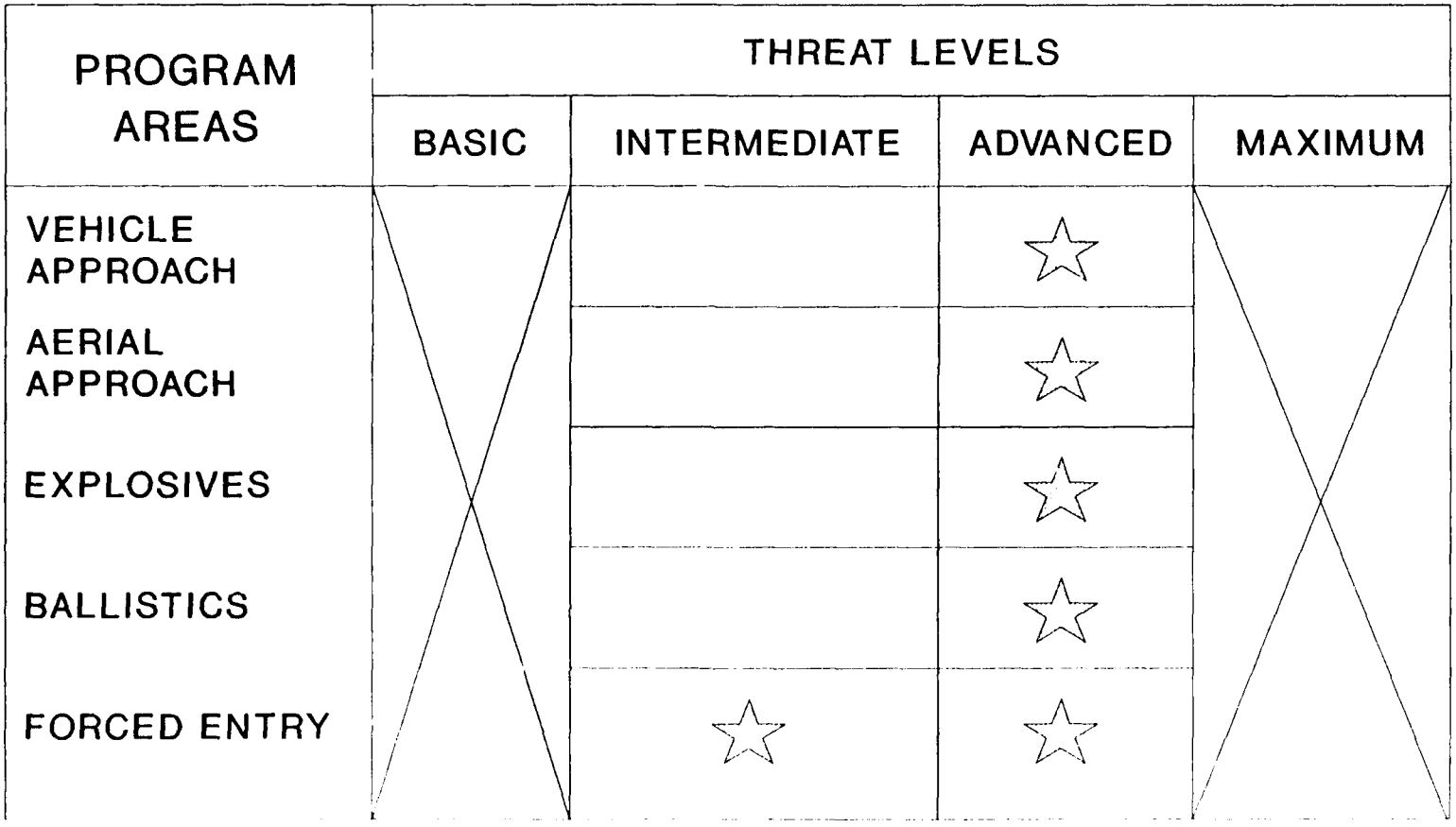
- VEHICLE APPROACH
- AERIAL APPROACH
- EXPLOSIVES
- BALLISTICS
- FORCED ENTRY
- COVERT ENTRY — DOES NOT REQUIRE BARRIER SYSTEMS
- MAIL/SUPPLY BOMB — CONSIDER IN EXPLOSIVES
- AIR/WATER CONTAMINATION — OUTSIDE OF DESIRED SCOPE-AT THIS TIME
- WATERSIDE/UNDERWATER ATTACK — EXAMINE IMPLEMENTATION POTENTIAL BEFORE INVESTING R&D DOLLARS

1. Program Areas Identified, 2/14/91, By Physical Security Experts

POTENTIAL PROGRAM AREAS
FOR SECOND LEVEL
PRIORITIZATION AND DEVELOPMENT

- VEHICLE APPROACH
- AERIAL APPROACH
- EXPLOSIVES
- BALLISTICS
- FORCED ENTRY

DESIGN THREAT
FOCUS



QUANTITATIVE SCORING OF A QUALITATIVE ASSESSMENT

Qualitative Score	Scoring Basis	Quantitative Representation
HIGH	High Probability ($.7 \leq Prob \leq 1.0$)	9
MEDIUM	Medium Probability ($.3 \leq Prob \leq .7$)	5
LOW	Low Probability ($0 \leq Prob \leq .3$)	2

Quantitative Representation = 2, 5, or 9

CRITERIA FOR PRIORITIZING ACROSS PROGRAM AREAS

• IMPORTANCE OF TARGET	——	Political/military significance of the target
• WIDE SPREAD APPLICATIONS	——	Large numbers of applications
• AFFORDABILITY	——	The degree to which the cost is expected to be reasonable
• FEASIBILITY	——	The degree to which the program is expected to be technically feasible
• OPERABILITY	——	The degree to which the effect on normal operations is minimized

CRITERIA FOR PRIORITIZING
RELATIVE WEIGHTING

CRITERIA	RELATIVE VALUE TO PROGRAM SCALE = 1 TO 10
IMPORTANCE OF TARGET	9
WIDE SPREAD APPLICATIONS	5
AFFORDABILITY	7
FEASIBILITY	8
OPERABILITY	6

RELATIVE VALUE ORDER	
IMPORTANCE OF TARGET	9
FEASIBILITY	8
AFFORDABILITY	7
OPERABILITY	6
WIDE SPREAD APPLICATIONS	5

PRIORITIZATION OF PROGRAM AREAS

BARRIER PROGRAM AREA	BARRIER SYSTEM EVALUATION CRITERIA					TOTAL SCORE
	TARGET IMPORTANCE (9)	TECHNICAL FEASIBILITY (8)	AFFORD-ABILITY (7)	OPER-ABILITY (6)	WIDE APPLI. (5)	
FORCED ENTRY	MEDIUM 9x5	HIGH 8x9	HIGH 7x9	HIGH 6x9	HIGH 5x9	279
VEHICLE APPROACH	HIGH 9x9	HIGH 8x9	HIGH 7x9	HIGH 6x9	MEDIUM 5x5	279
EXPLOSIVES	HIGH 9x9	MEDIUM 8x5	LOW 7x2	MEDIUM 6x5	HIGH 5x9	210
BALLISTICS	MEDIUM 9x5	MEDIUM 8x5	MEDIUM 7x5	MEDIUM 6x5	MEDIUM 5x5	175
AERIAL APPROACH	HIGH 9x9	LOW 8x2	LOW 7x2	LOW 6x2	LOW 5x2	133

SCORING

QUALITATIVE	QUANTITATIVE
HIGH →	9
MEDIUM →	5
LOW →	2

( ) - VALUE ASSIGNED TO EVALUATION CRITERIA

PRIORITIZED ORDER FOR BARRIER PROGRAM AREAS [1]

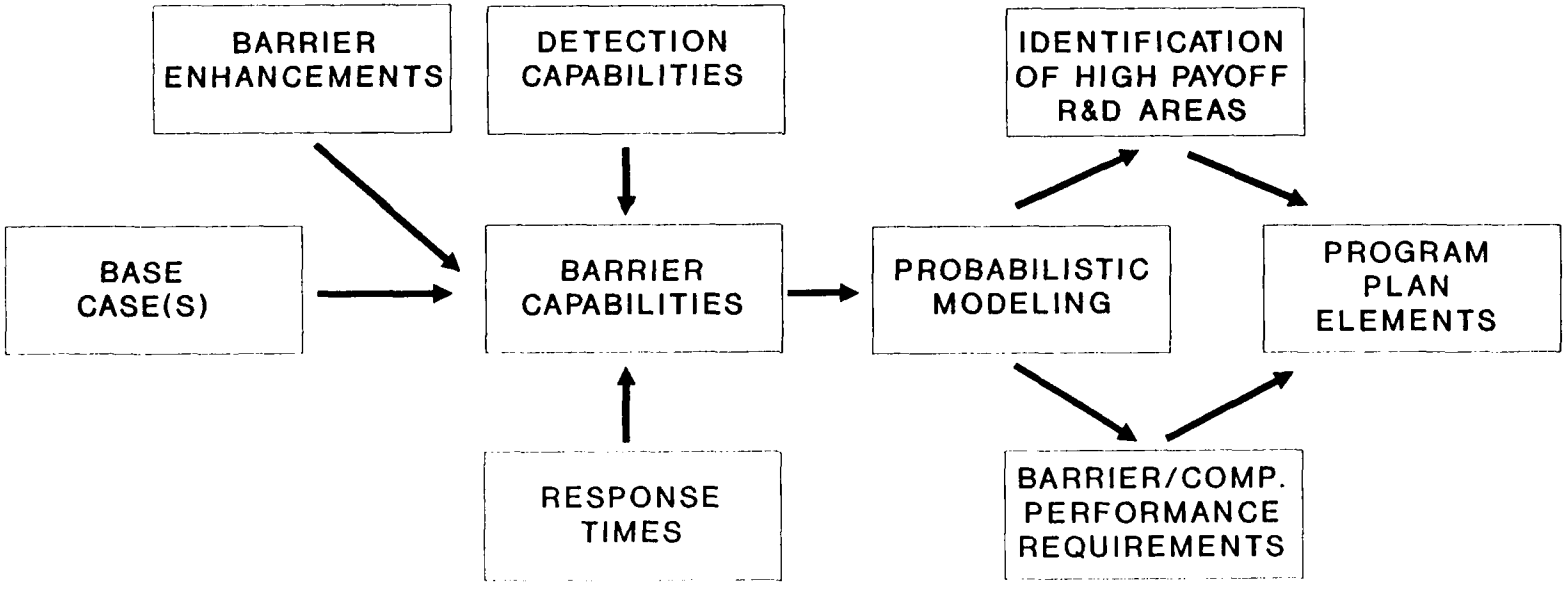
- FORCED ENTRY
- VEHICLE APPROACH
- EXPLOSIVES
- BALLISTICS
- AERIAL APPROACH

1. LISTED IN ORDER OF IMPORTANCE BASED ON PRIORITIZATION ANALYSIS.

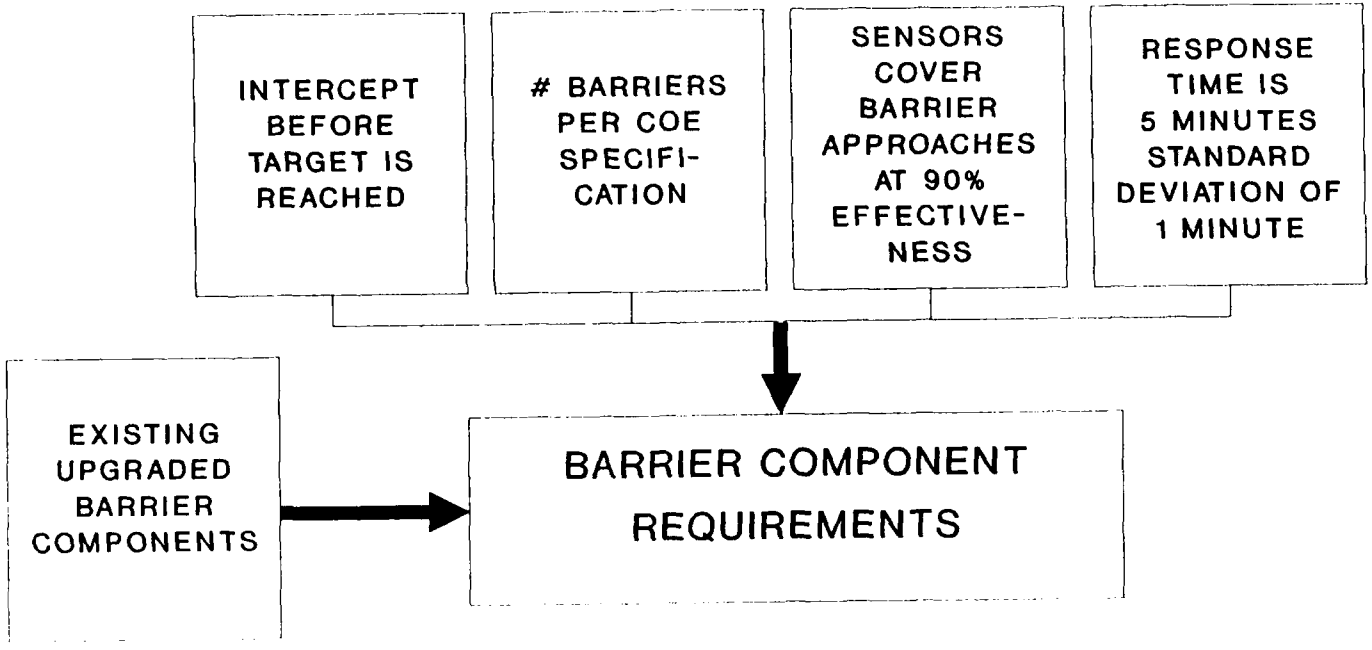
FORCED ENTRY ANALYSES

FORCED ENTRY

THE ASSESSMENT PROCESS



FORCED ENTRY ANALYSIS
ASSUMPTIONS



FORCED ENTRY
COMPONENT REQUIREMENT DEFINITION

THREAT [1,2]	BARRIER PROFILE [2]	PROTECTION LEVELS [2]
ADVANCED (with and without explosive tools)	EXTERIOR ONLY	LOW 50-65%
	EXTERIOR + ONE	MEDIUM 66-80%
	EXTERIOR + TWO	HIGH 81-95%
		VERY HIGH 96-100%

ANALYSIS ASSUMPTIONS

SENSOR PERFORMANCE

- SENSORS PERFORM AT 90 %
- ONE SENSOR SYSTEM COVERING EACH BARRIER OR BARRIER APPROACH

RESPONSE TIME

- MEAN VALUE = 5 MINUTES
- STAND. DEV. = 1 MINUTE

  EARLIEST = 2 MINUTES
  LATEST = 8 MINUTES

1. Threat as defined in Threat Statement for Army Materiel Command, 1989.
2. Tools profiles, barrier profiles, and protection levels as described in Corps of Engineers Security Handbook
3. Barrier component performance estimates from Sandia Barrier Technology Handbook

SCOPE OF FORCED ENTRY
ANALYSIS PARAMETERS

- ADVANCED THREAT
  - WITHOUT EXPLOSIVE TOOLS
  - WITH EXPLOSIVE TOOLS
- PROTECTION LEVEL
  - MEDIUM PROTECTION
  - HIGH AND VERY HIGH PROTECTION
- BARRIER SYSTEM CONFIGURATION
  - ONE PERIMETER BARRIER
  - ALL NON-EXTERIOR BARRIERS ARE INSIDE

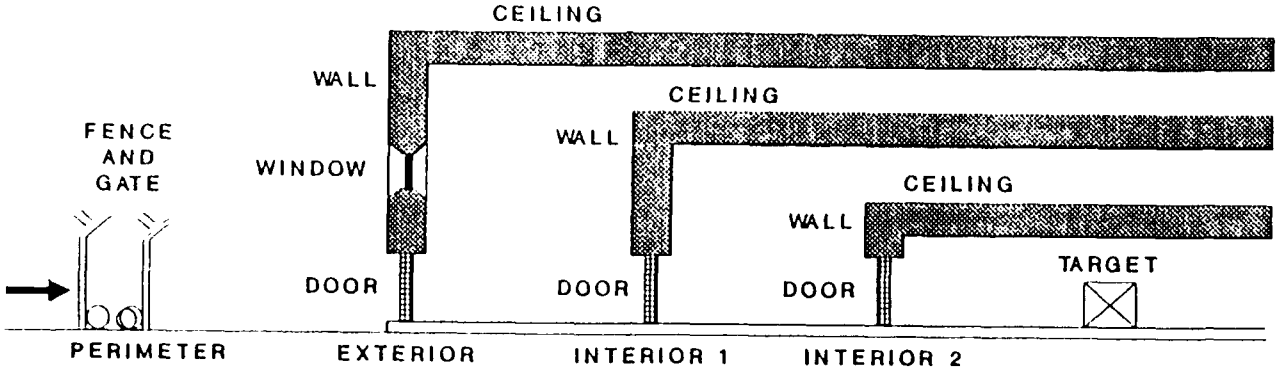
DEFINITION OF EXPLOSIVE TOOLS

EXPLOSIVES USED SPECIFICALLY TO BREACH AN OBSTACLE OR BARRIER, NOT USED AS A WEAPON. INCLUDES PRE-PACKAGED BULK EXPLOSIVES, MOLDABLE FORMS, CONICAL AND LINEAR SHAPED CHARGES, ETC.

SCOPE OF FORCED ENTRY ANALYSES

- FOCUS ON HIGH AND VERY HIGH PROTECTION LEVELS
- UP TO 3 BARRIERS, INCLUDING EXTERIOR OF BUILDING
- SENSORS AT EACH BARRIER APPROACH (AT 90% PERFORMANCE)
- BUILDING SECURITY
- SECURITY RESPONSE GOALS -
  - INTERCEPT BEFORE REACHING TARGET
  - INTERCEPT BEFORE ESCAPE
- RESPONSE TIME IS 5 MINUTES WITH 1 MINUTE STANDARD DEVIATION
  2 MIN. $\leq$ RESPONSE TIME $\leq$ 8 MIN. (99% OF THE TIME)
- PERFORMANCE DATA SOURCES
  - CORPS OF ENGINEERS SECURITY HANDBOOK
  - SANDIA BARRIER TECHNOLOGY HANDBOOK
- BARRIER TYPES (PASSIVE)
  - DOORS
  - GATES
  - WALLS
  - FENCES
  - WINDOWS
  - CEILINGS/FLOORS

ASSESSMENT SITUATION
BASE CASE



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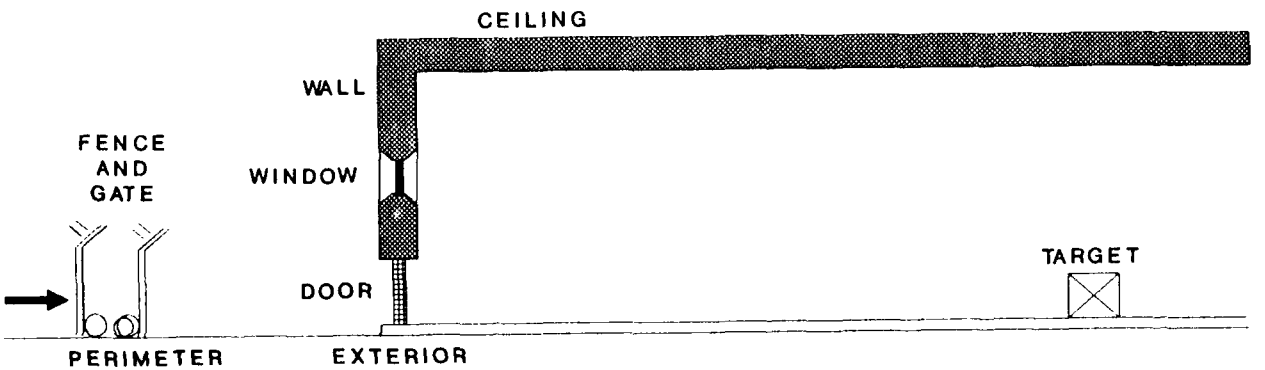
CASE DEFINITIONS FOR FORCED ENTRY ANALYSES

BARRIER OPTIONS	PROTECTION LEVELS			
	MEDIUM		HIGH/ VERY HIGH	
	CONFIG. #1	CONFIG. #2	CONFIG. #1	CONFIG. #2
PERIMETER	*		*	
EXTERIOR	*	*	*	*
INTERIOR 1		*	*	*
INTERIOR 2				*
CASE NUMBER	A1P B1P	A1I B1I	A2P B2P	A2I B2I

A - W/O EXPLOSIVE TOOLS
B - WITH EXPLOSIVE TOOLS
1 - MEDIUM PROTECTION (EXTERIOR PLUS ONE BARRIER)
2 - HIGH/VERY HIGH PROTECTION (EXTERIOR PLUS TWO BARRIERS)
P - PERIMETER FENCING USED
I - EXTERIOR PLUS TWO INSIDE BARRIERS

ASSESSMENT SITUATION
MEDIUM PROTECTION LEVEL
BUILDING EXTERIOR + PERIMETER FENCE



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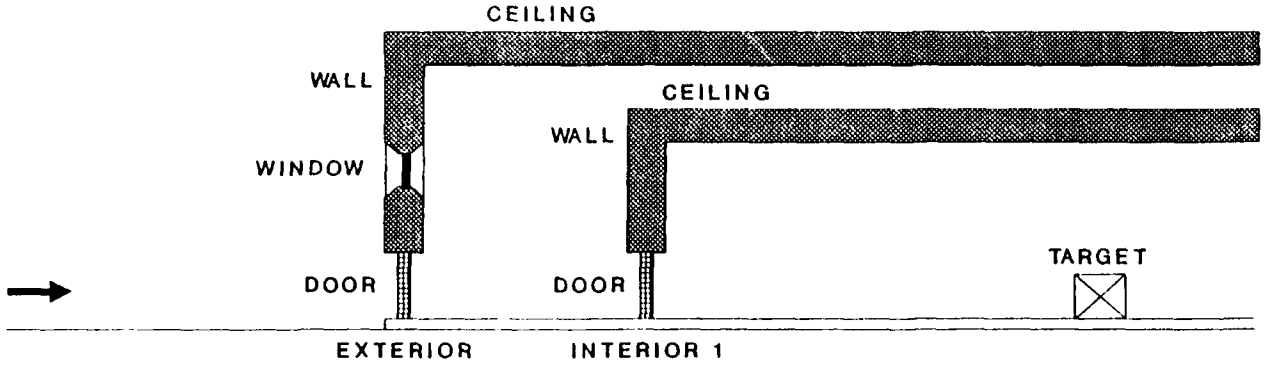
- DOOR, STANDARD INDUSTRIAL PEDESTRIAN WITH 16-GAUGE METAL, PANIC HARDWARE-MORTISE, CYLINDER LOCK, BUTT HINGES WITH NON-REMOVABLE PINS, FRONT PRY STRIP, HINGE Z STRIP, PANIC BAR PLATE
- EXTERIOR WALL, CONCRETE BLOCK 8" THICK, REINFORCED
- CEILING, PLASTER LATH CEILING ON GYPSUM BOARD ATTACHED TO BOTTOM OF 4" CONCRETE FLOOR WITH 6X6" NO. 10 WIRE MESH

ASSESSMENT SITUATION
MEDIUM PROTECTION LEVEL
BUILDING EXTERIOR + ONE INTERIOR BARRIER



DESCRIPTION OF BARRIER COMPONENTS

- EXTERIOR WALL, CONCRETE BLOCK 8" THICK, REINFORCED
- WINDOW WITH STEEL MESH OVER 1/8" GLASS IN METAL SECURITY SASH, SMALLER THAN MAN-SIZED PANES
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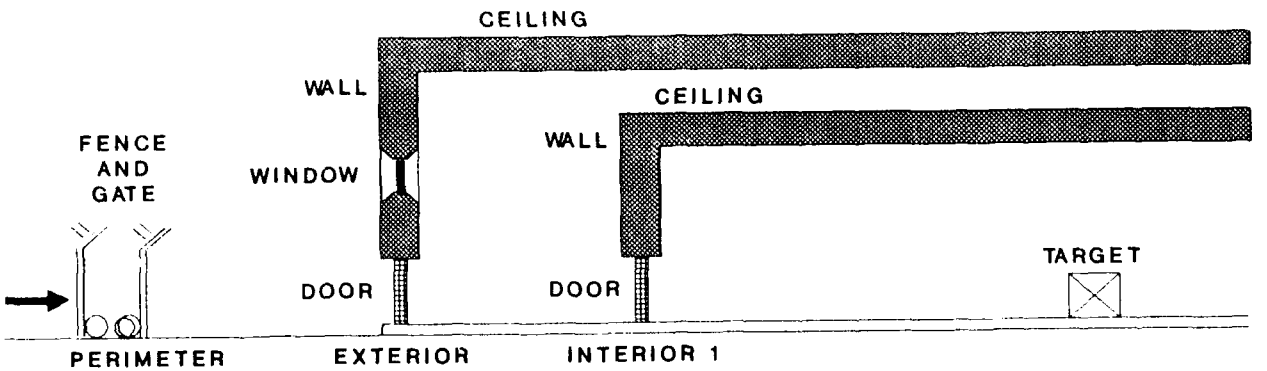
- INTERIOR WALL, 3/8" GYPSUM ON EACH SIDE OF 2X4 STUDS, 3.6" STEEL STUDS WITH 1/8" STEEL PLATE WELDED ON BACK
- CEILING, PLASTER LATH CEILING ON GYPSUM BOARD ATTACHED TO BOTTOM OF 4" CONCRETE FLOOR WITH 6X6" NO. 10 WIRE MESH

ASSESSMENT SITUATION

HIGH/VERY HIGH PROTECTION LEVEL

BUILDING EXTERIOR + ONE INTERIOR BARRIER + PERIMETER FENCE



DESCRIPTION OF BARRIER COMPONENTS

- 2 SEVEN FT FENCES AND BARBED TAPE, 100 FT BETWEEN
- GATE, 4X8' CHAIN LINK-PIPE WITH 11 GAUGE X 2" MESH ON 1.9" METAL PIPE FRAME, CHAINED AND PADLOCKED
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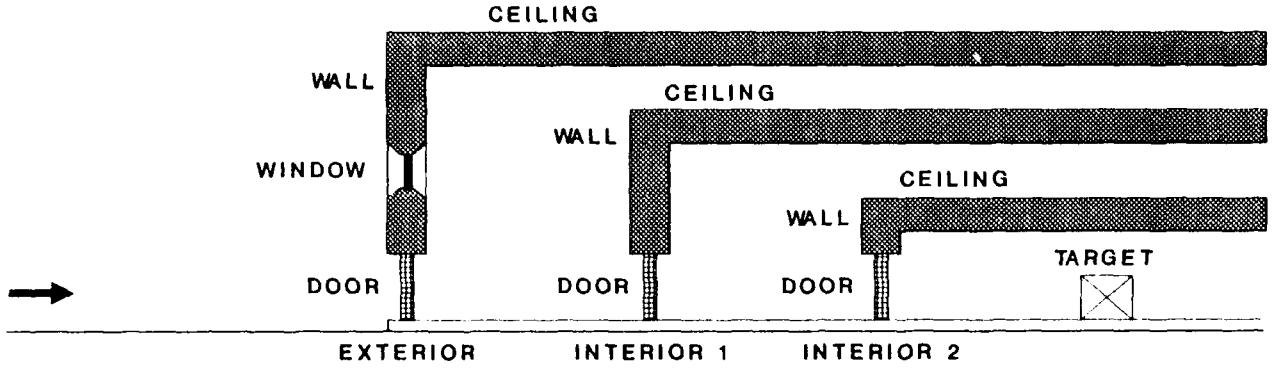
ASSESSMENT SITUATION
HIGH/VERY HIGH PROTECTION LEVEL
BUILDING EXTERIOR + TWO INTERIOR BARRIERS



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WINDOWS

1/8 " STANDARD GLASS SMALLER THAT MAN-SIZED PANES IN METAL SECURITY SASH

TOOLS	TOOL WEIGHT (lbs)	PENETRATION TIME (min)			# OF INTRUDERS
		MIN	MEAN	MAX	
HAMMER/ TORCH	60	0.3	0.6	0.9	1

STEEL MESH OVER 1/8" GLASS IN METAL SECURITY SASH, SMALLER THAN MAN-SIZED PANES

TOOLS	TOOL WEIGHT (lbs)	PENETRATION TIME (min)			# OF INTRUDERS
		MIN	MEAN	MAX	
HAMMER/ TORCH	60	0.9	1.8	2.7	1
EXPLOSIVES	2	-	1.0	-	1

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UPGRADED STANDARD INDUSTRIAL DOOR

STANDARD INDUSTRIAL PEDESTRIAN DOOR, 16-GAUGE METAL, PANIC HARDWARE-MORTISE, CYLINDER LOCK, BUTT HINGES WITH NON-REMOVABLE PINS, FRONT PRY STRIP, HINGE Z STRIP, PANIC BAR PLATE.

TOOLS	TOOL WEIGHT (lbs)	PENETRATION TIME (min)			# OF INTRUDERS
		MIN	MEAN	MAX	
HAMMERS, PRYBARS	23	0.5	1.0	1.5	2
EXPLOSIVES, LINEAR SHAPED CHARGE (0.3)	2	0.4	0.8	1.2	1

Security Engineering Manual and Barriers Technology Handbook Data

WALLS

3/4" SIDING ON EACH OF 2X4 STUDS. WOOD - 5" THICK

TOOLS	TOOL WEIGHT (lbs)	PENETRATION TIME (min)			# OF INTRUDERS
		MIN	MEAN	MAX	
BRACE & BIT & SABRE SAW	5	0.7	1.4	2.1	1

3/8" GYPSUM ON EACH SIDE OF 2X4 STUDS, 3.6" STEEL STUDS WITH 1/8" STEEL PLATE WELDED ON BACK SIDE

TOOLS	TOOL WEIGHT (lbs)	PENETRATION TIME (min)			# OF INTRUDERS
		MIN	MEAN	MAX	
SLEDGE & TORCH	65	1.4	2.8	4.2	1
EXPLOSIVES	2	-	1.0	-	1

Security Engineering Manual and Barriers Technology Handbook Data

CEILING

PLASTER LATH CEILING ON GYPSUM BOARD ATTACHED TO WOOD STUDS WITH FIBERGLASS INSULATION

TOOLS	TOOL WEIGHT (lbs)	PENETRATION TIME (min)			# OF INTRUDERS
		MIN	MEAN	MAX	
FIRE AXE	5	0.5	1.0	1.5	1

PLASTER LATH CEILING ON GYPSUM BOARD ATTACHED TO BOTTOM OF 4" CONCRETE FLOOR WITH 6X6-INCH, NO. 10 WIRE MESH

TOOLS	TOOL WEIGHT (lbs)	PENETRATION TIME (min)			# OF INTRUDERS
		MIN	MEAN	MAX	
EXPLOSIVES (0.3) SLEDGE, BOLTCUTTERS, TAPE	26.3	1.2	2.4	3.6	1

Security Engineering Manual and Barriers Technology Handbook Data

FENCES

TWO 7-FT, 9-GAUGE X 2 INCH MESH WITH 45° BARBED WIRE OUTRIGGERS, SEPARATED BY 100FT OPEN AREA

TOOLS	TOOL WEIGHT (lbs)	PENETRATION TIME (min)			# OF INTRUDERS
		MIN	MEAN	MAX	
LADDER	15	.35	0.7	1.05	2

9 GAUGE BY 2" MESH, 7 FOOT

TOOLS	TOOL WEIGHT (lbs)	PENETRATION TIME (min)			# OF INTRUDERS
		MIN	MEAN	MAX	
GLOVES	.5	.05	.10	.15	1

Security Engineering Manual and Barriers Technology Handbook Data

GATES
CHAIN LINK-PIPE

4X8 FT GATE, 11 GAUGE X 2 INCH MESH ON 1.9 INCH METAL PIPE FRAME, CHAINED AND PADLOCKED

TOOLS	TOOL WEIGHT (lbs)	PENETRATION TIME (min)			# OF INTRUDERS
		MIN	MEAN	MAX	
HACKSAW	.5	0.5	1.0	1.5	1

BASE CASE ASSUMPTIONS

- NUMBER OF BARRIERS ARE DEFINED BY PROTECTION LEVEL
- BARRIER SYSTEM COMPONENTS ARE SELECTED BASED UPON EXPECTED USAGE AND PERFORMANCE
- BARRIER SYSTEM COMPONENTS CONSIDERED
  - 2 SEVEN FT FENCES AND BARBED TAPE, 100 FT BETWEEN
  - WINDOW WITH STEEL MESH OVER 1/8" GLASS IN METAL SECURITY SASH, SMALLER THAN MAN SIZED PANES
  - DOOR, STANDARD INDUSTRIAL PEDESTRIAN WITH 16-GAUGE METAL, PANIC HARDWARE-MORTISE, CYLINDER LOCK, BUTT HINGES WITH NON-REMOVABLE PINS, FRONT PRY STRIP, HINGE Z STRIP, PANIC BAR PLATE
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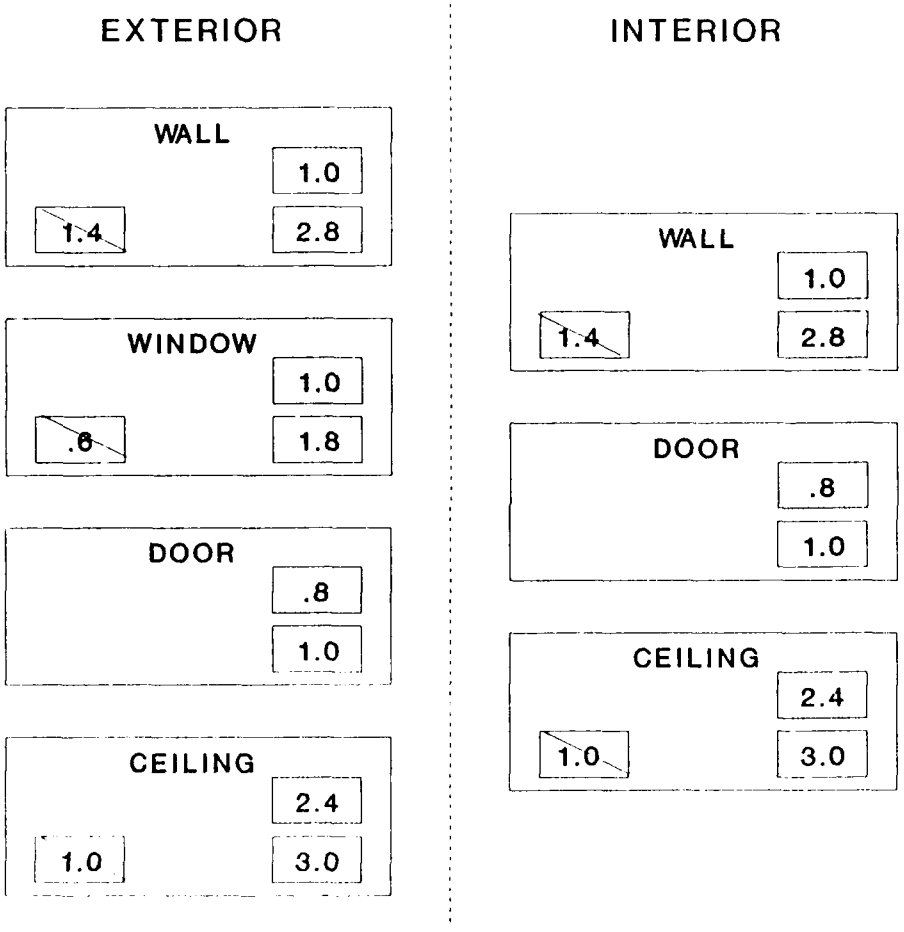
  - CEILING, PLASTER LATH CEILING ON GYPSUM BOARD ATTACHED TO BOTTOM OF 4" CONCRETE FLOOR WITH 6X6" NO. 10 WIRE MESH
  - GATE, 4X8' CHAIN LINK-PIPE WITH 11 GAUGE X 2" MESH ON 1.9" METAL PIPE FRAME, CHAINED AND PADLOCKED

PATH DIAGRAM
SITUATIONS A1I AND B1I

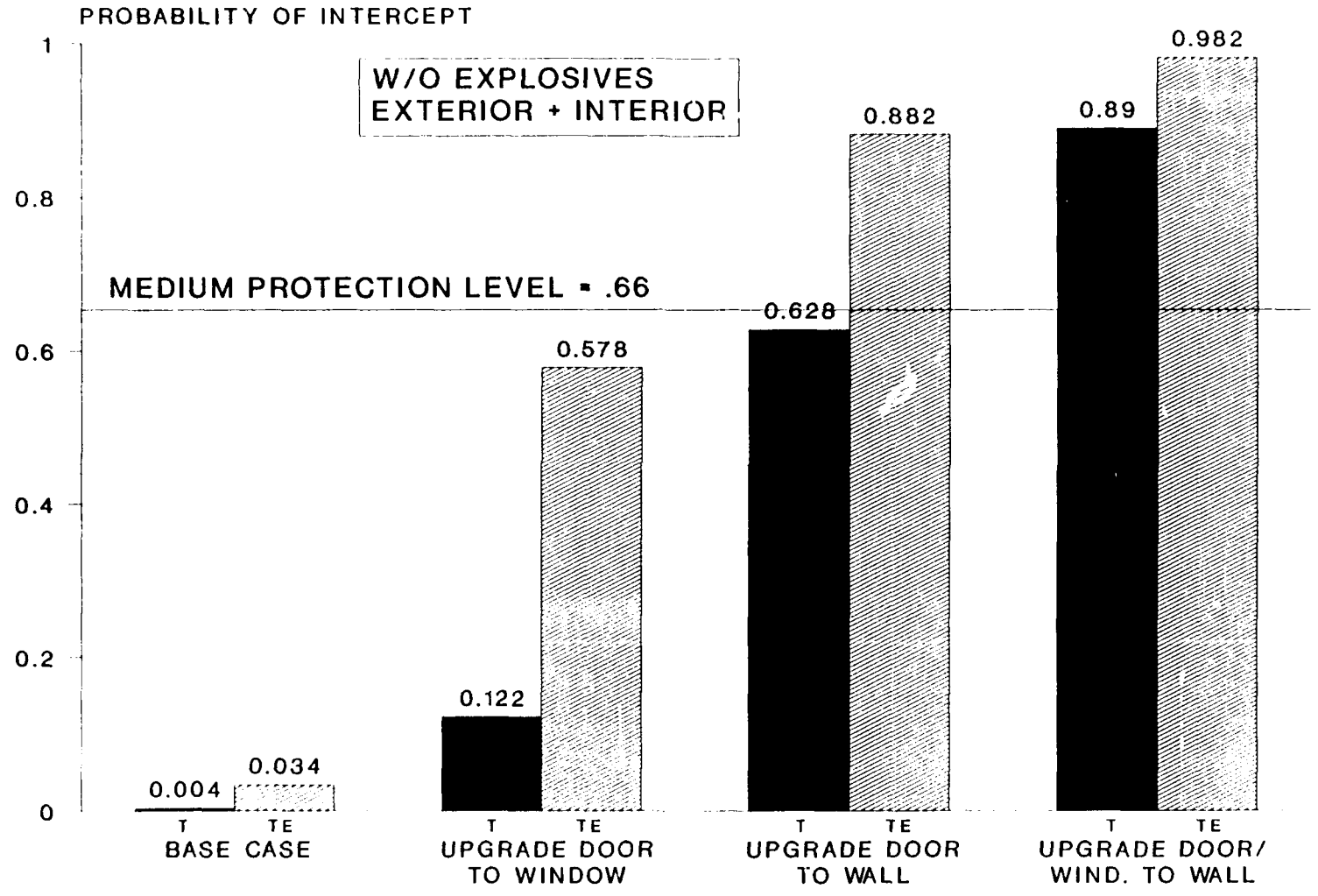


= NOT EVALUATED

= TIME DELAY IF THREAT USES EXPLOSIVE TOOLS

ENHANCEMENTS

SITUATION A1I



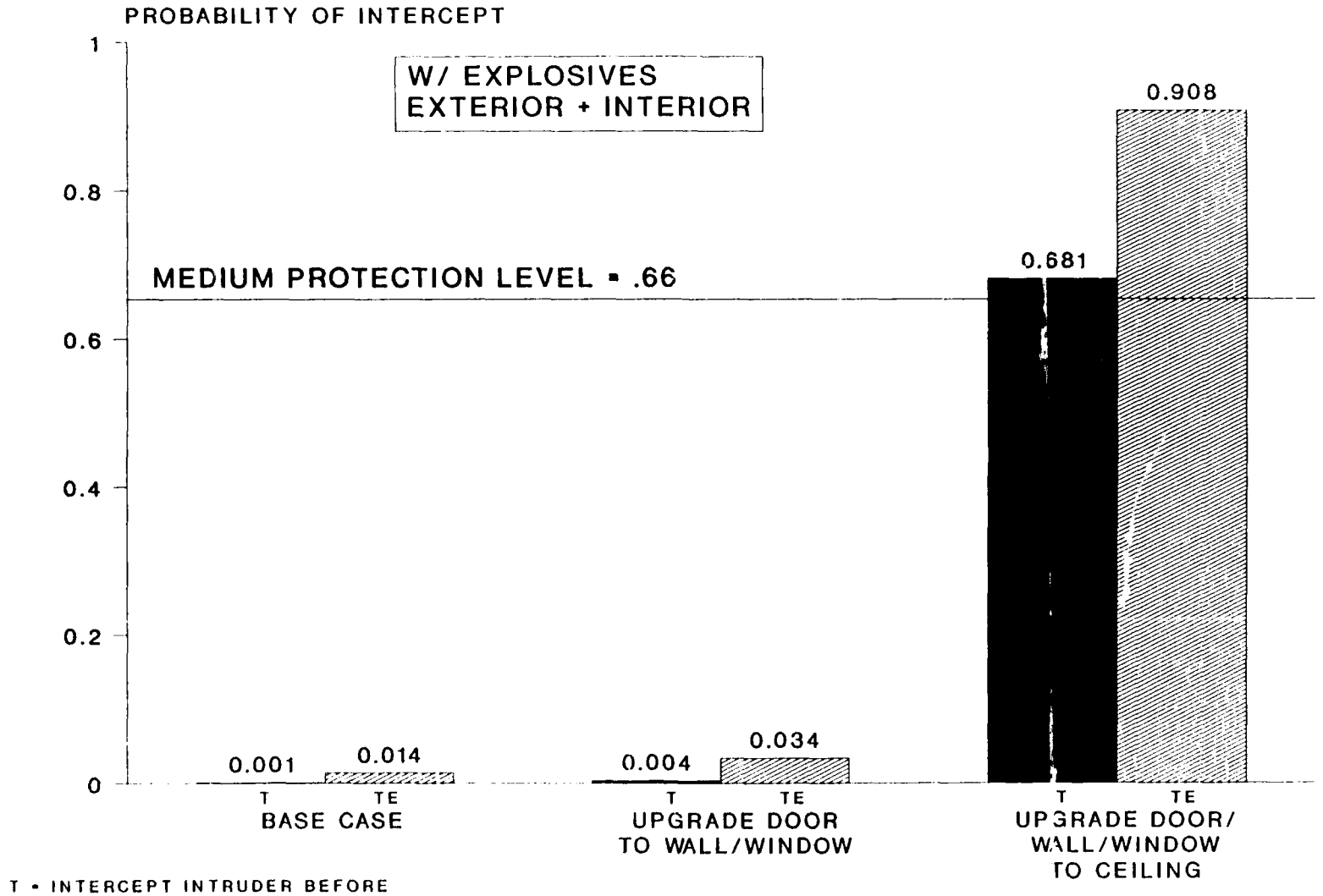
T = INTERCEPT INTRUDER BEFORE REACHING TARGET

TE = INTERCEPT INTRUDER BEFORE ESCAPE

PERFORMANCE LEVEL

ENHANCEMENTS

SITUATION B1I

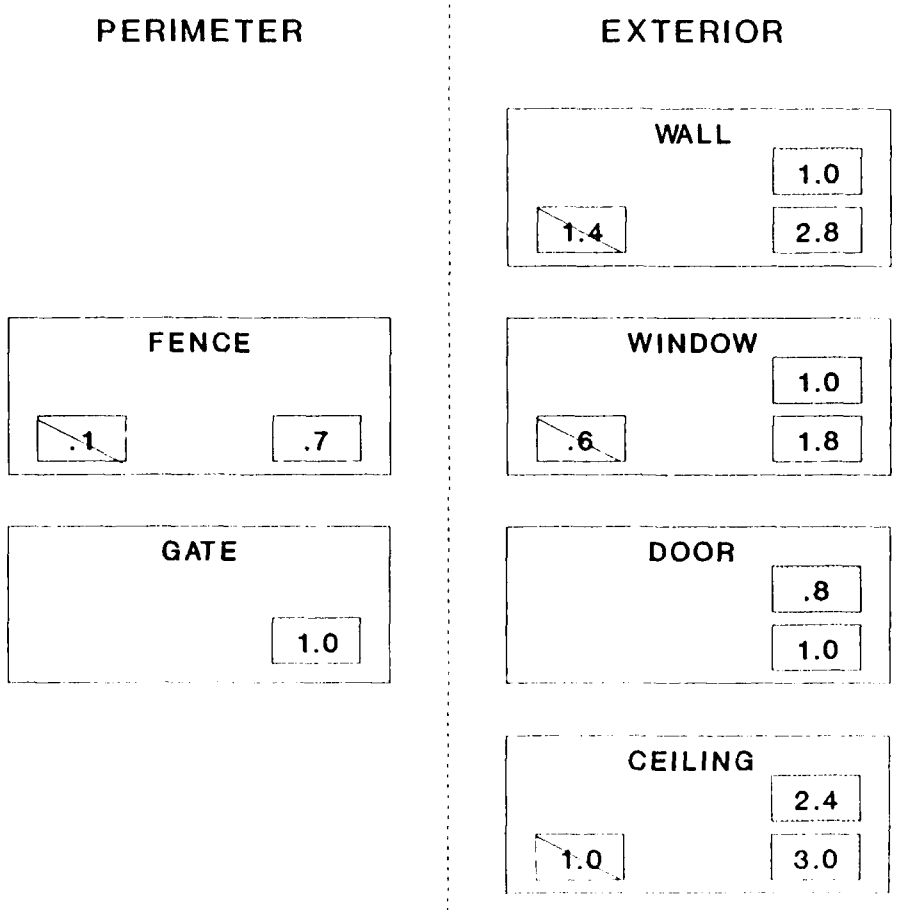


T = INTERCEPT INTRUDER BEFORE REACHING TARGET

TE = INTERCEPT INTRUDER BEFORE ESCAPE

PERFORMANCE LEVEL

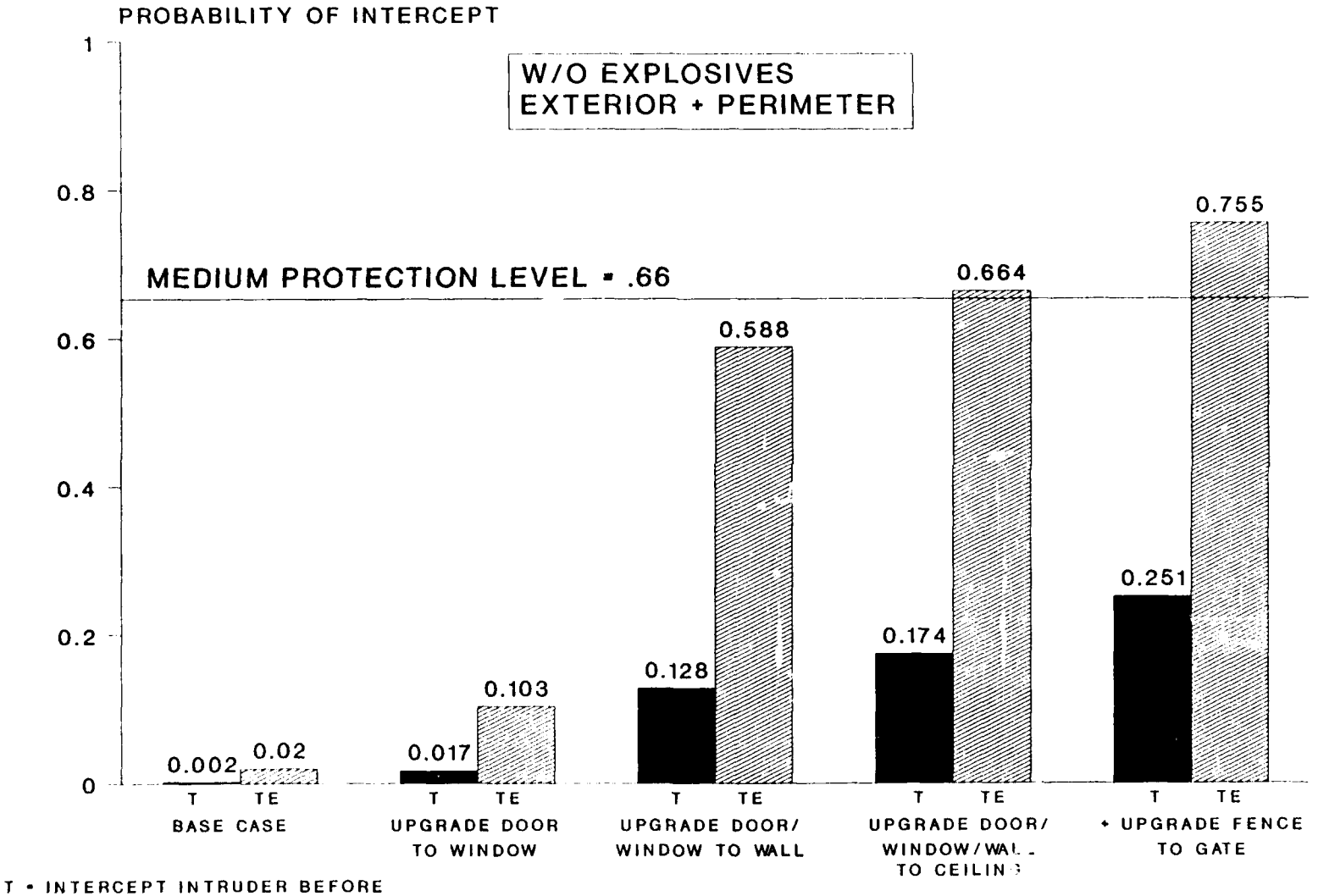
PATH DIAGRAM
SITUATIONS A1P AND B1P



= NOT EVALUATED

= TIME DELAY IF THREAT USES EXPLOSIVE TOOLS

ENHANCEMENTS
SITUATION A1P



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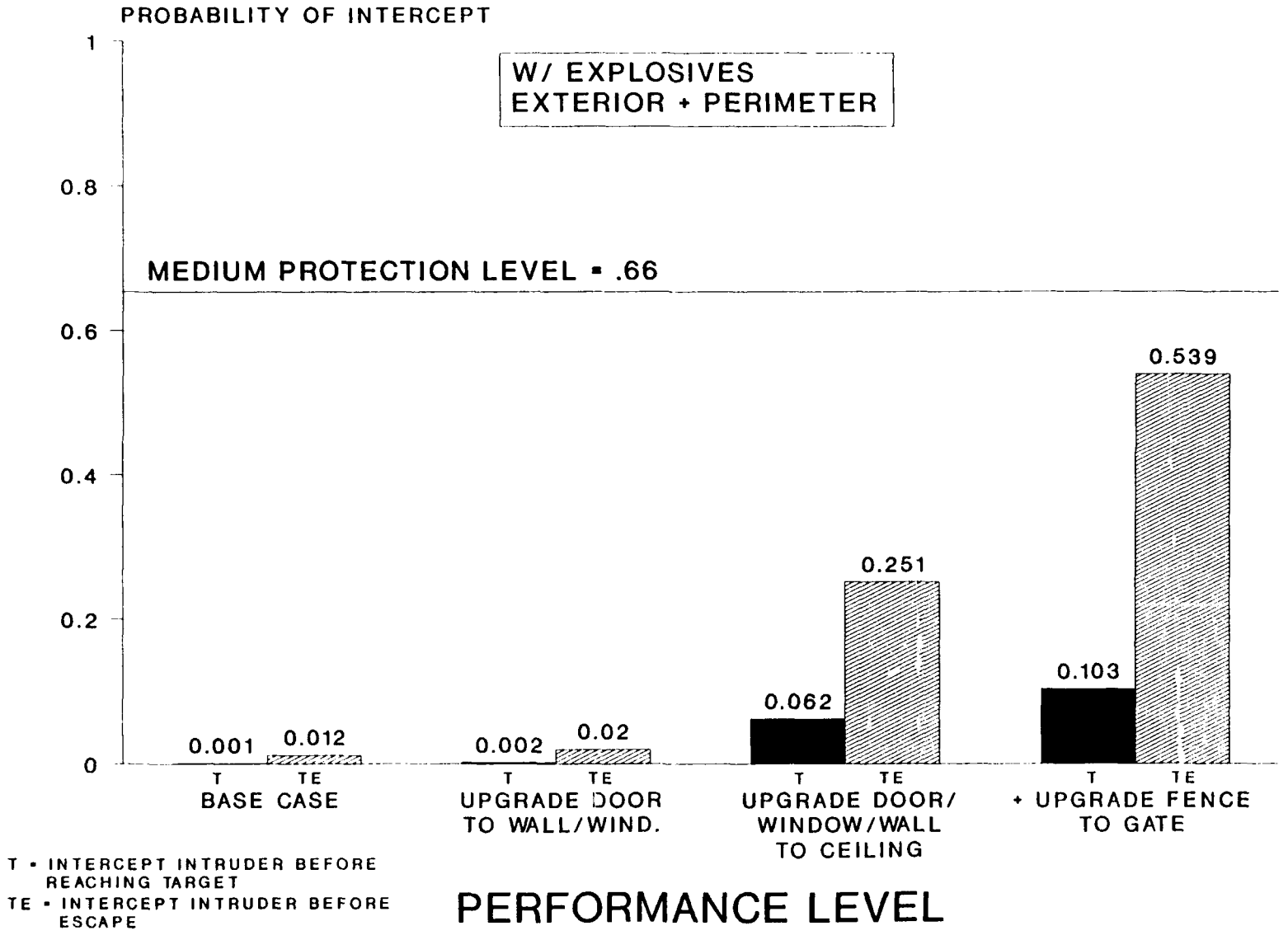
PERFORMANCE LEVEL

ENHANCEMENTS
SITUATION B1P



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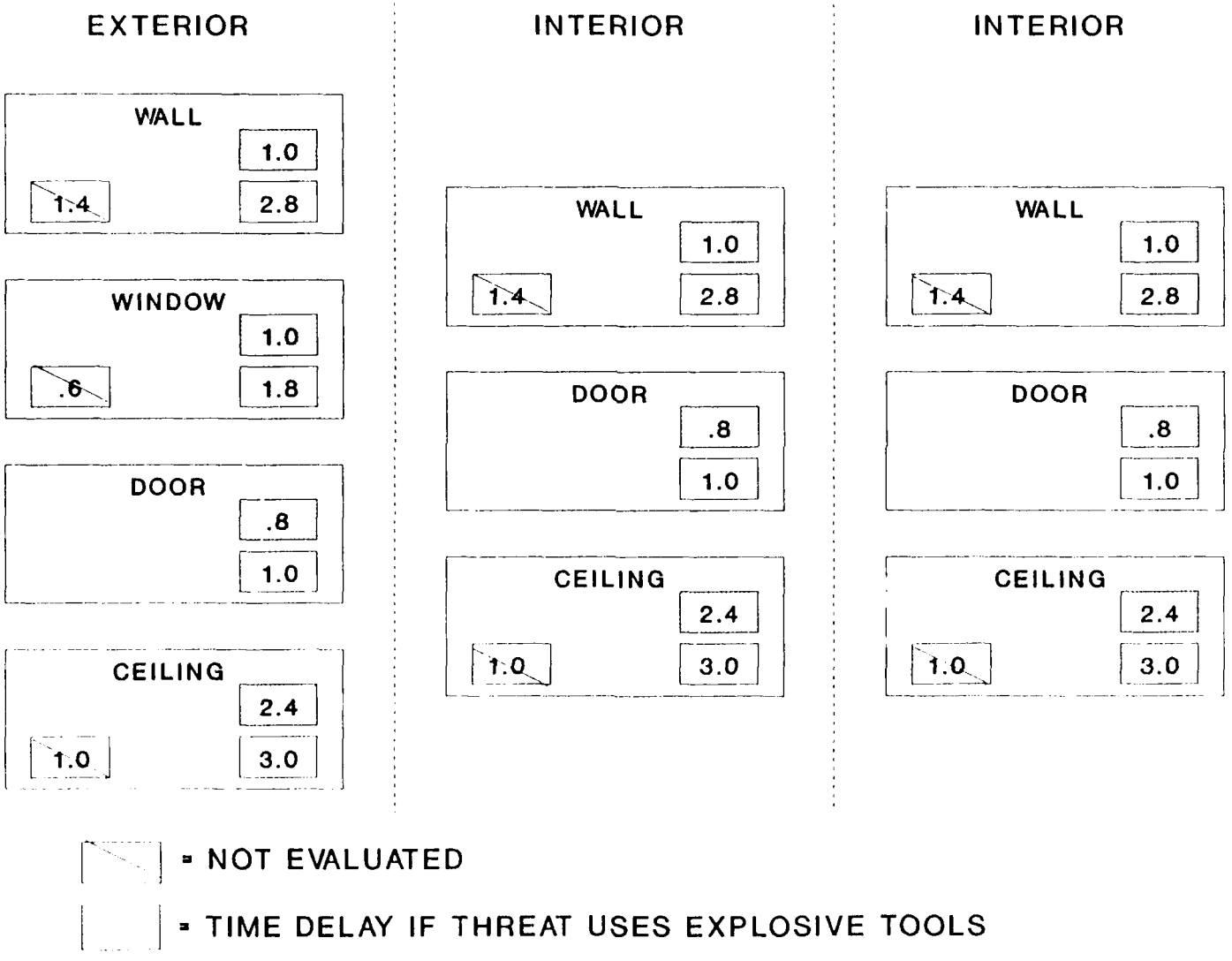
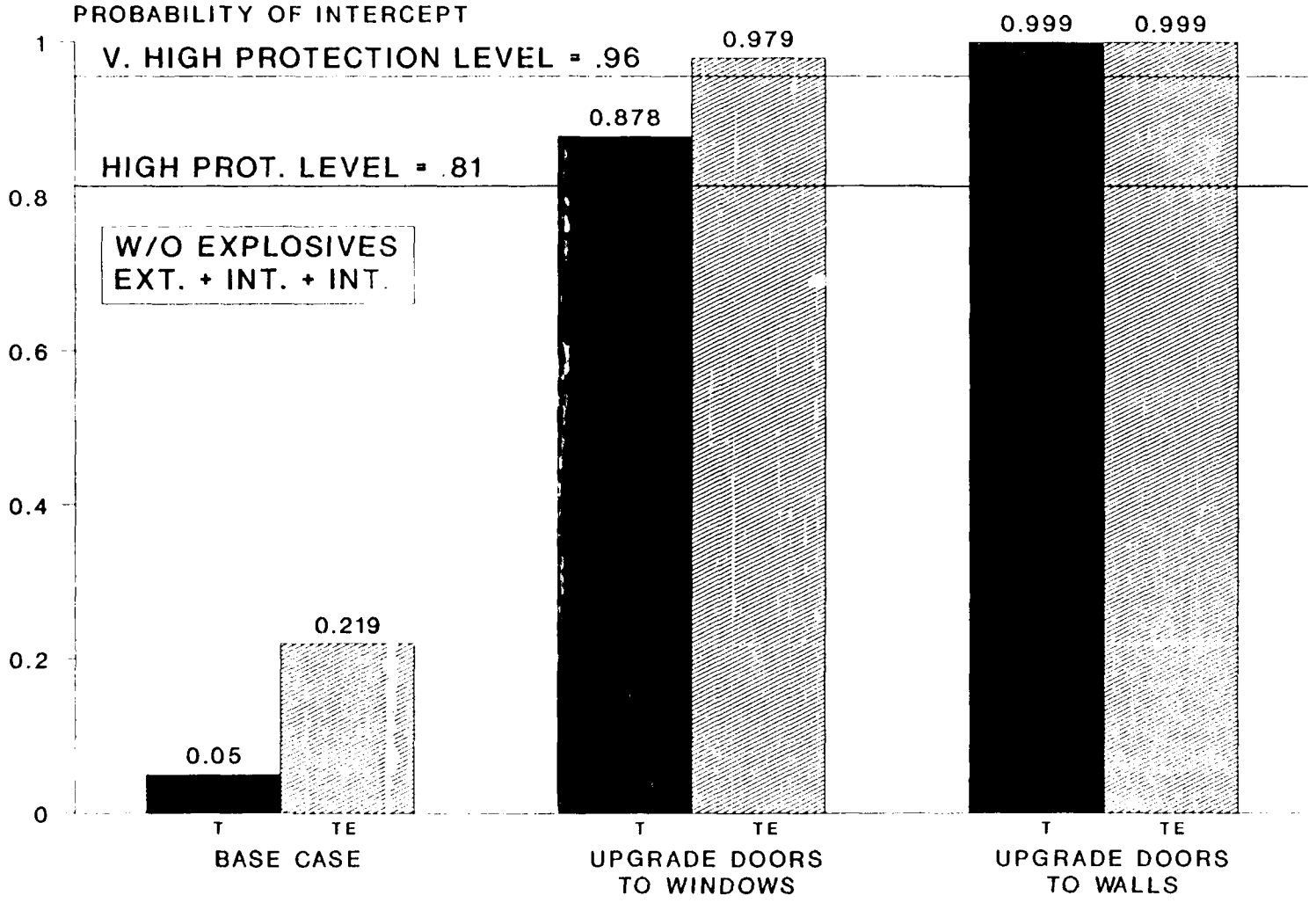
PATH DIAGRAM
SITUATIONS A2I AND B2I



ENHANCEMENTS

SITUATION A2I



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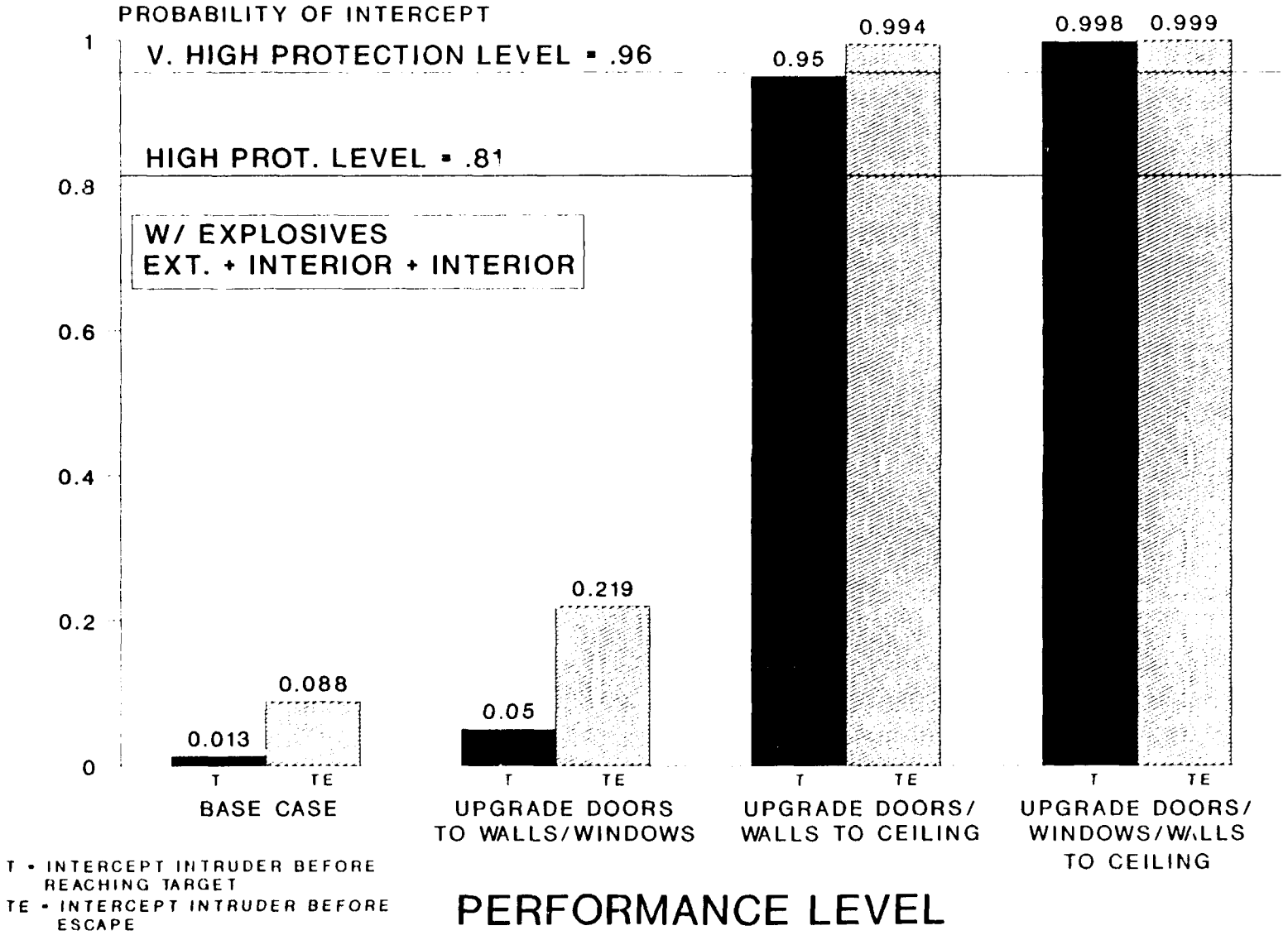
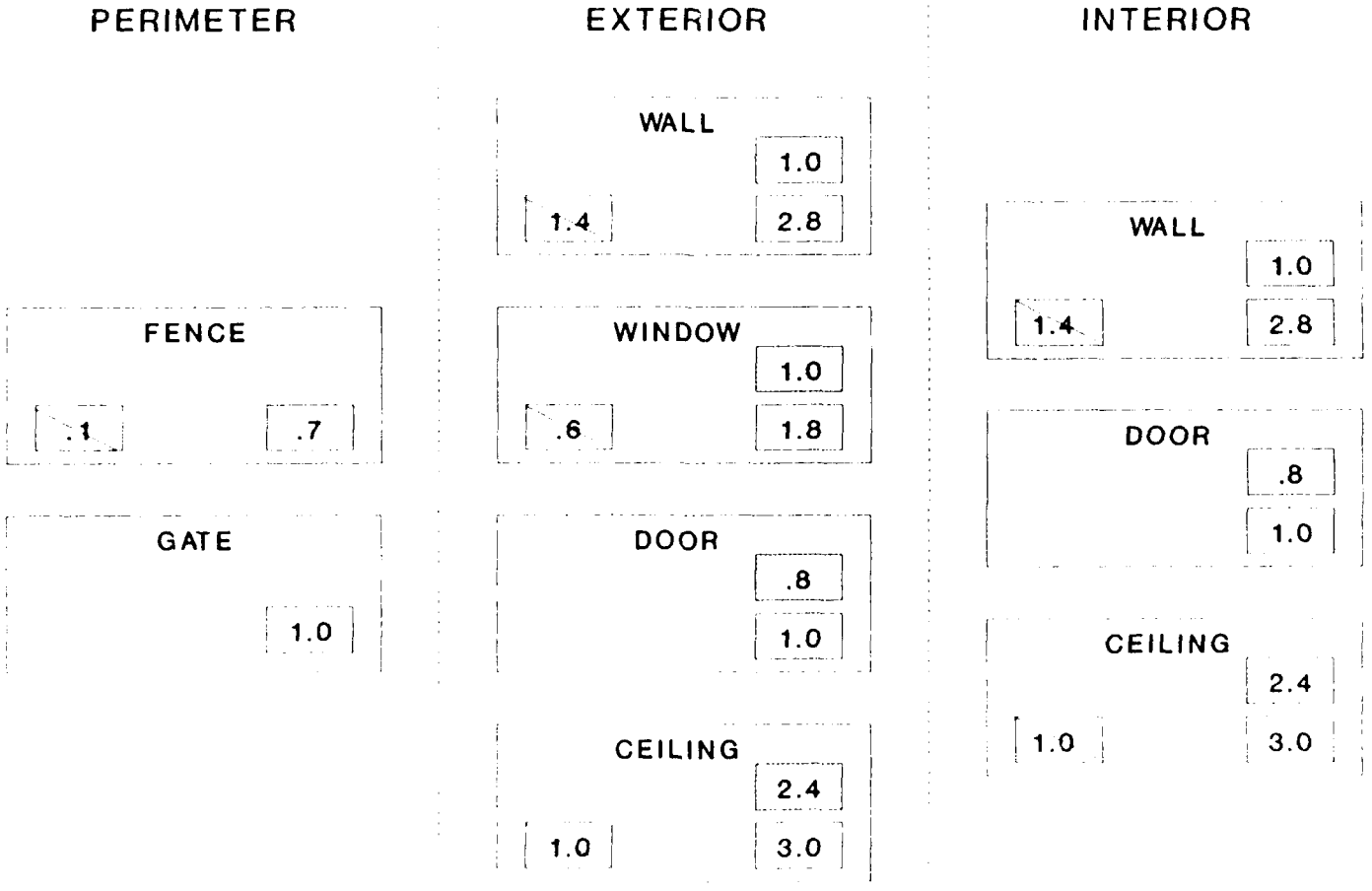
PERFORMANCE LEVEL

ENHANCEMENTS

SITUATION B2I



PATH DIAGRAM
SITUATIONS A2P AND B2P

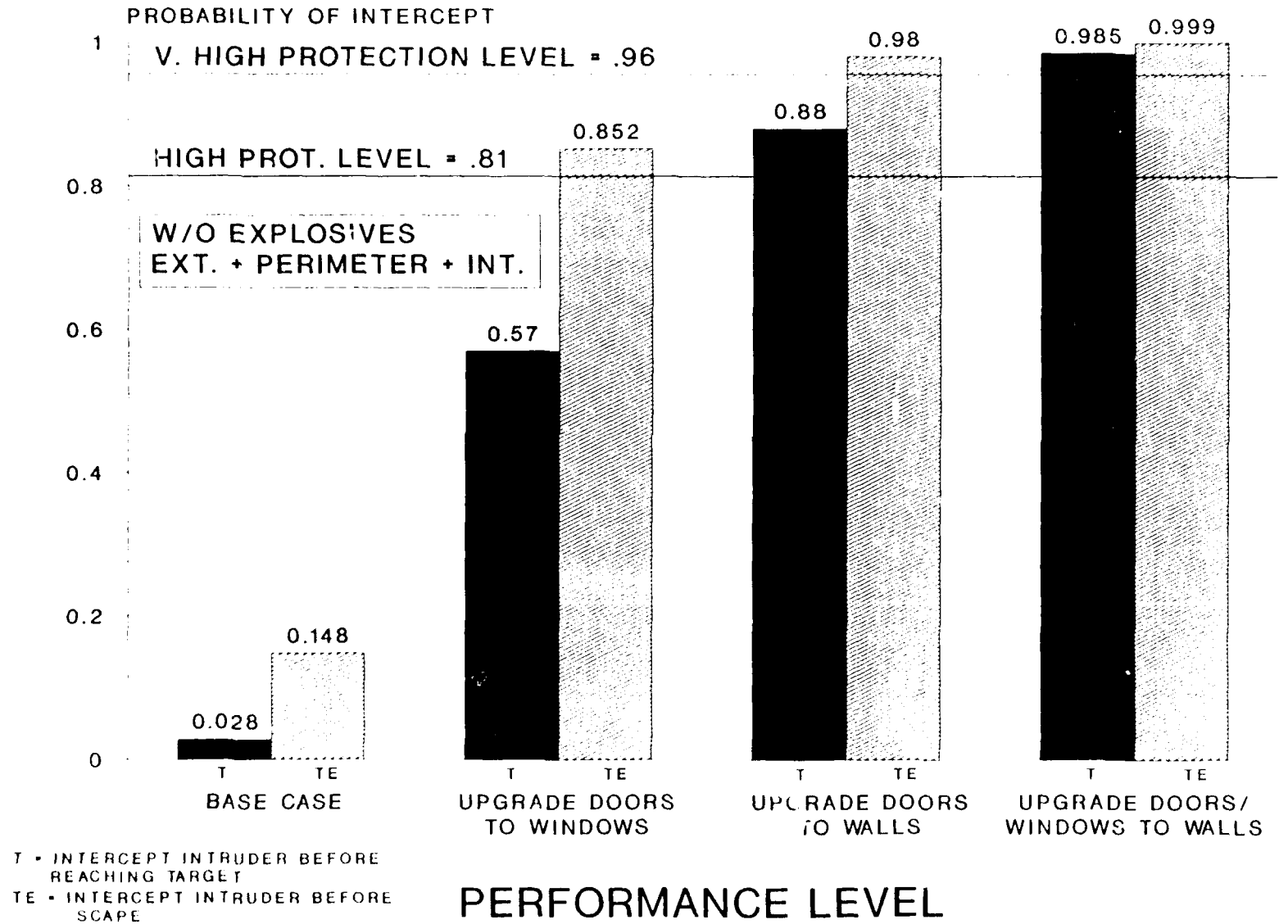


= NOT EVALUATED

= TIME DELAY IF THREAT USES EXPLOSIVE TOOLS

ENHANCEMENTS

SITUATION A2P



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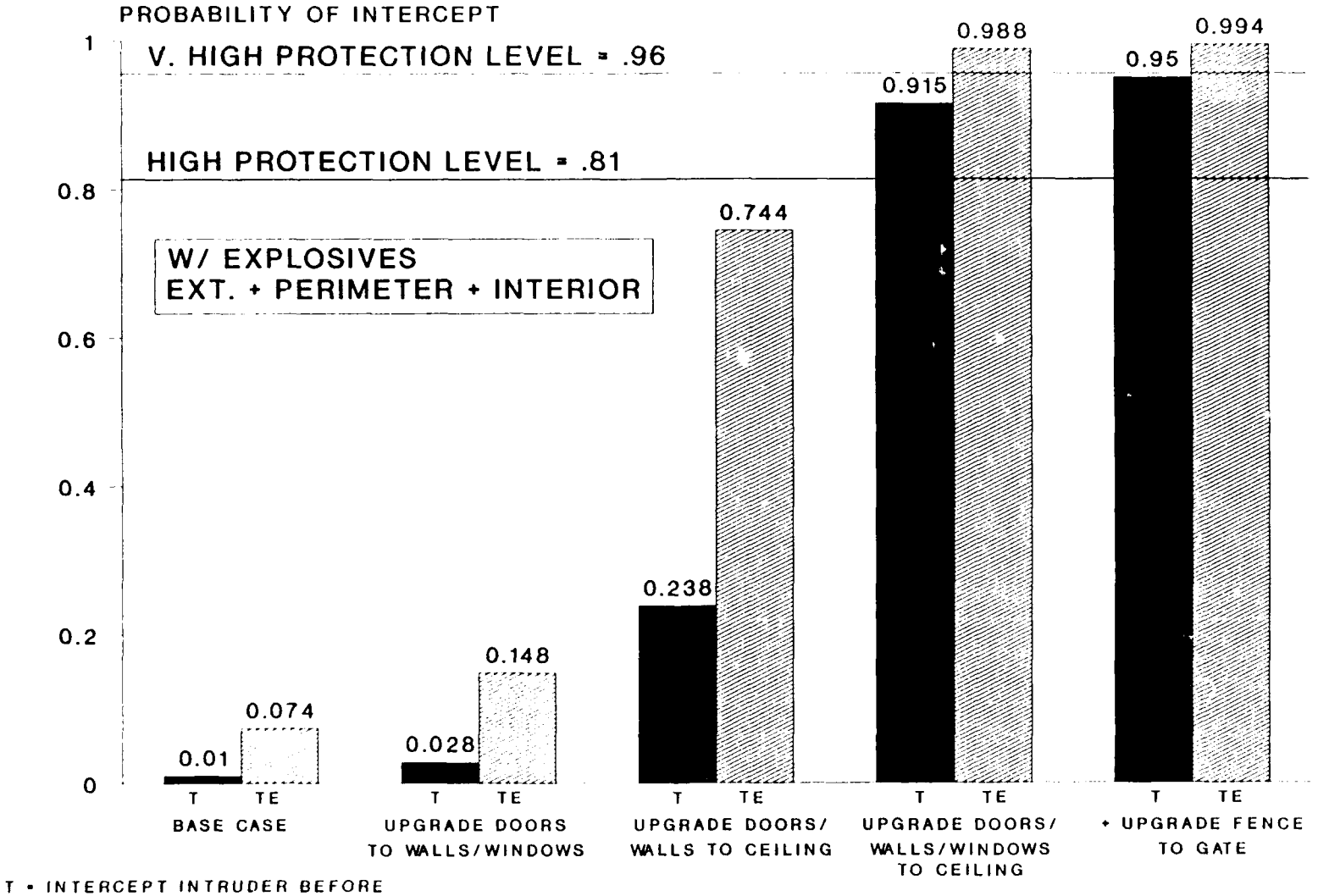
PERFORMANCE LEVEL

ENHANCEMENTS

SITUATION B2P



T = INTERCEPT INTRUDER BEFORE REACHING TARGET

TE = INTERCEPT INTRUDER BEFORE ESCAPE

PERFORMANCE LEVEL

FORCED ENTRY
POTENTIAL R&D PROGRAM(S)

- FIXED SITE PHYSICAL SECURITY BARRIER COMPONENTS

  PASSIVE BARRIER COMPONENT UPGRADES
  - DOORS
  - WINDOWS

  ACTIVE BARRIER COMPONENT DEVELOPMENT/INTEGRATION
  - LOCAL AREA BARRIER SYSTEM
  - WIDE AREA BARRIER SYSTEM

- MOBILE SITE PHYSICAL SECURITY BARRIER COMPONENTS

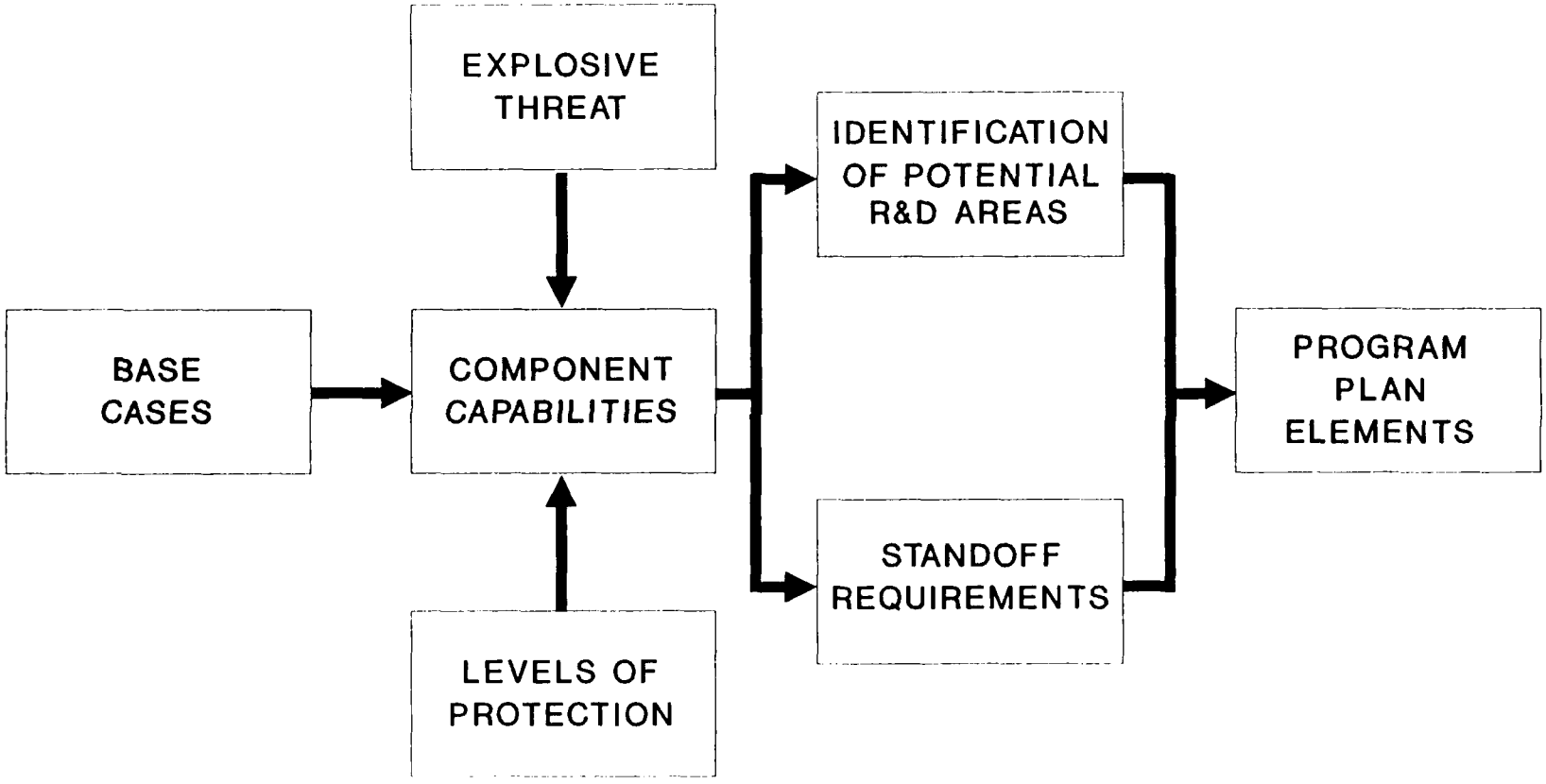
FORCED ENTRY PROGRAM ELEMENTS
PERFORMANCE REQUIREMENTS (MINUTES)

	THREAT TOOL KIT	
	Requirement W/O Explosive Tools	Available W/ Explosive Tools
WINDOW	2.8	1.0 (△-1.8)*
DOOR	2.8	0.8 (△-2.0)*
WALL	N/A	1.0 (△-1.8)*
ACTIVE	?	-2.0*

* -2.0 minute additional delay required for each barrier when explosive tools are used

EXPLOSIVES ANALYSES

EXPLOSIVES
ASSESSMENT PROCESS



EXPLOSIVE THREAT

EXTERIOR - 2000# TNT EQUIVALENT

INTERIOR - 50# TNT EQUIVALENT

MAIL BOMB - 2# TNT EQUIVALENT

LEVELS OF PROTECTION

LOW LEVEL - HIGH DEGREE OF DAMAGE WITHOUT COLLAPSE; OCCUPANTS MAY BE INJURED AND OTHER ASSESTS DAMAGED: STRUCTURE REQUIRES REPLACEMENT

MEDIUM LEVEL - SIGNIFICANT DEGREE OF DAMAGE; OCCUPANTS AND OTHER ASSETS SUSTAIN MINOR INJURY OR DAMAGE; STRUCTURE REUSABLE

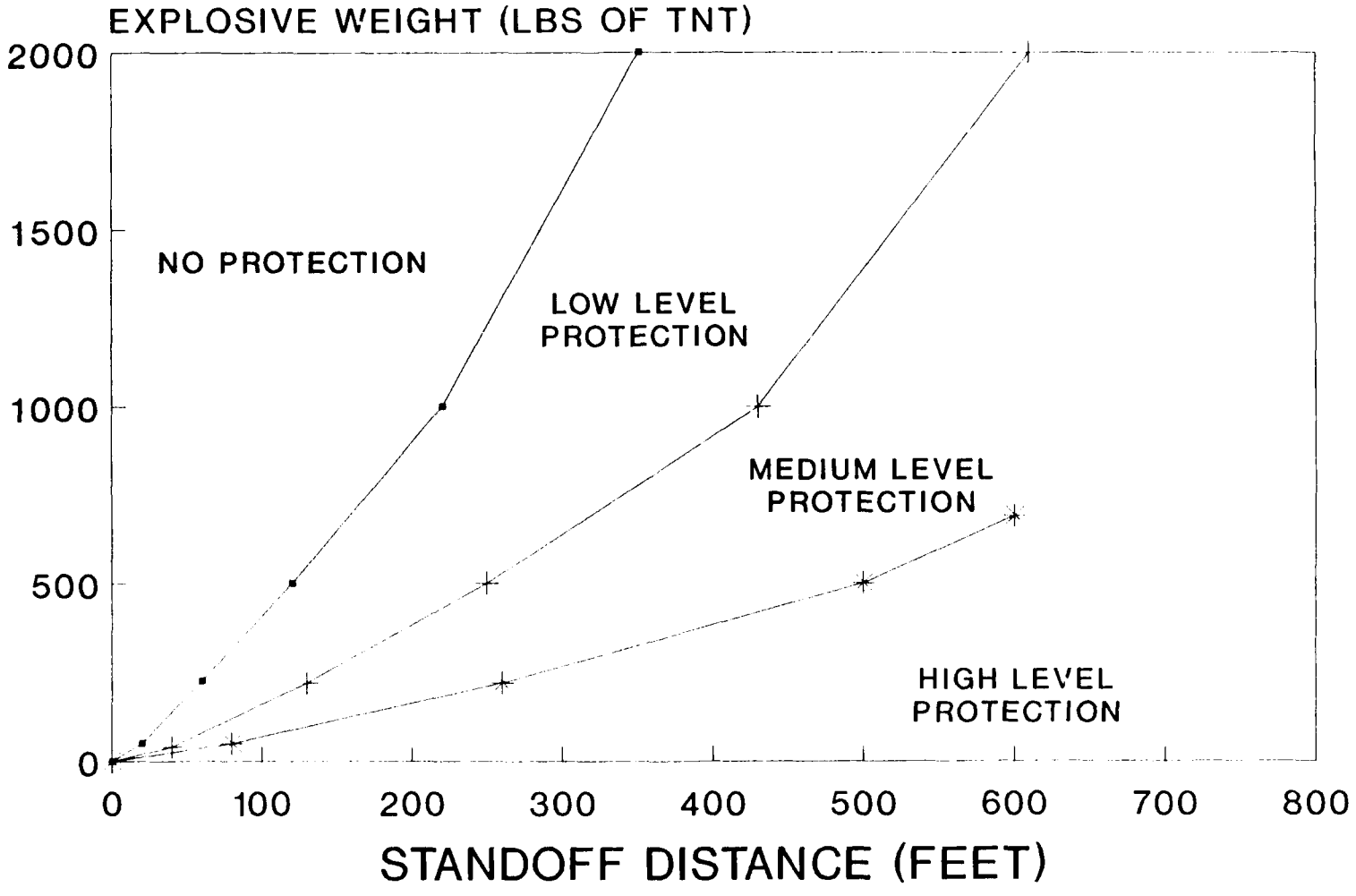
HIGH LEVEL - SUPERFICIAL DAMAGE TO STRUCTURE, OCCUPANTS AND OTHER ASSETS

EXTERIOR THREAT

EXPLOSIVE:	UP TO 2000# TNT EQUIVALENT
CONVEYANCE:	CAR, TRUCK, BOAT
PURPOSE:	MASS DESTRUCTION

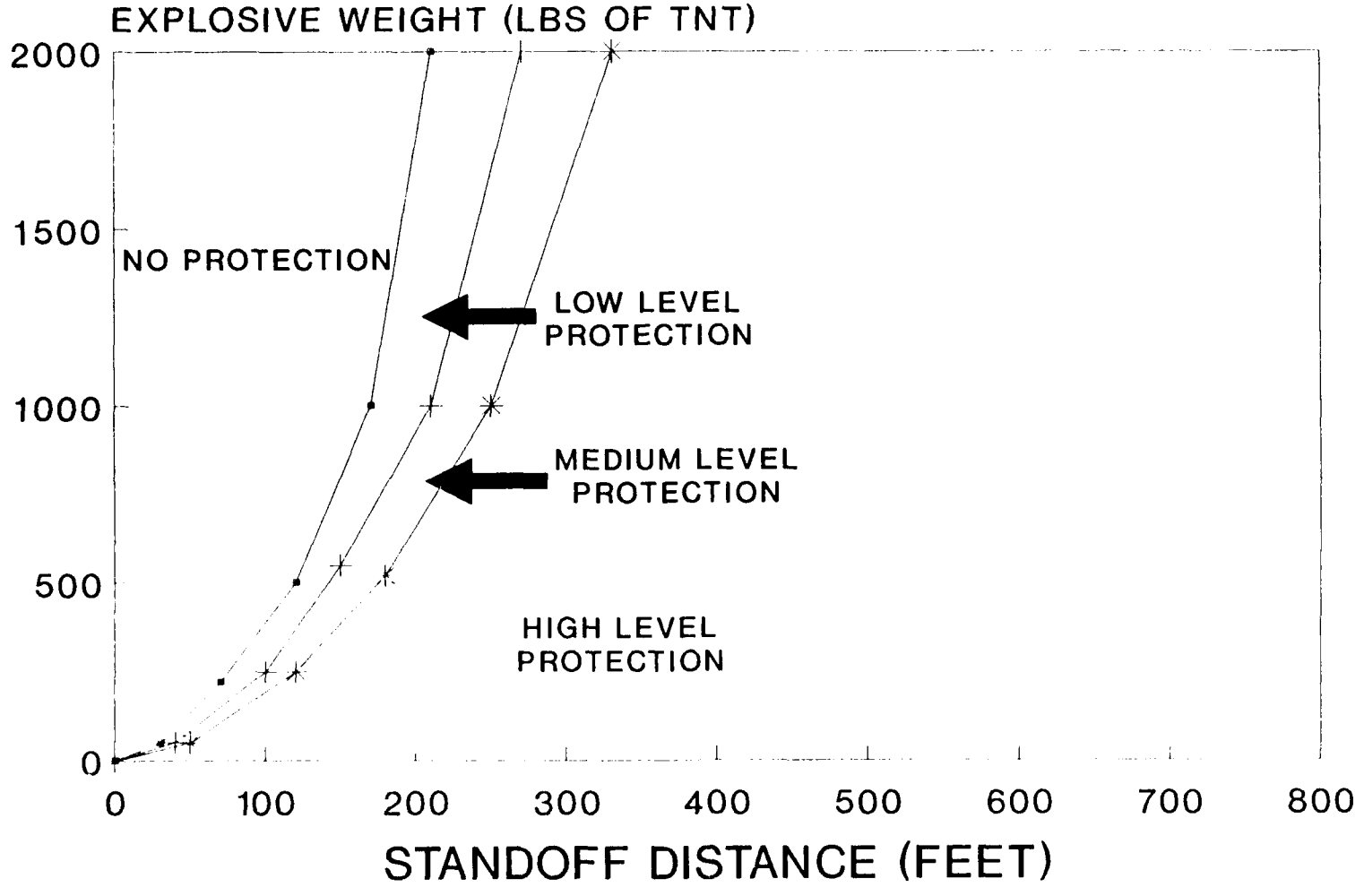
LEVELS OF PROTECTION

PLAIN 8" MASONARY WALL



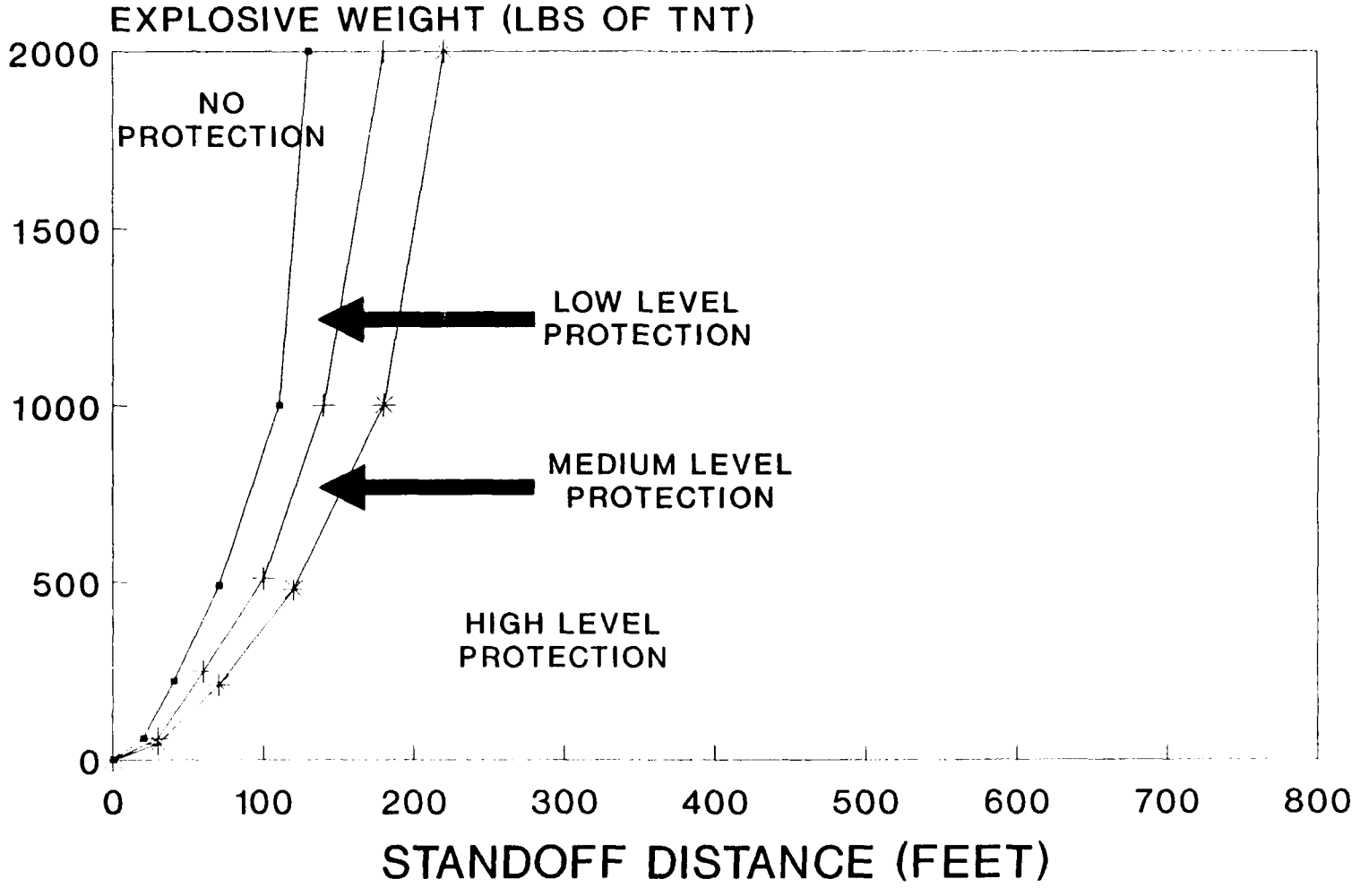
Security Engineering Manual Data

LEVELS OF PROTECTION
8" REINFORCED CONCRETE BLOCK



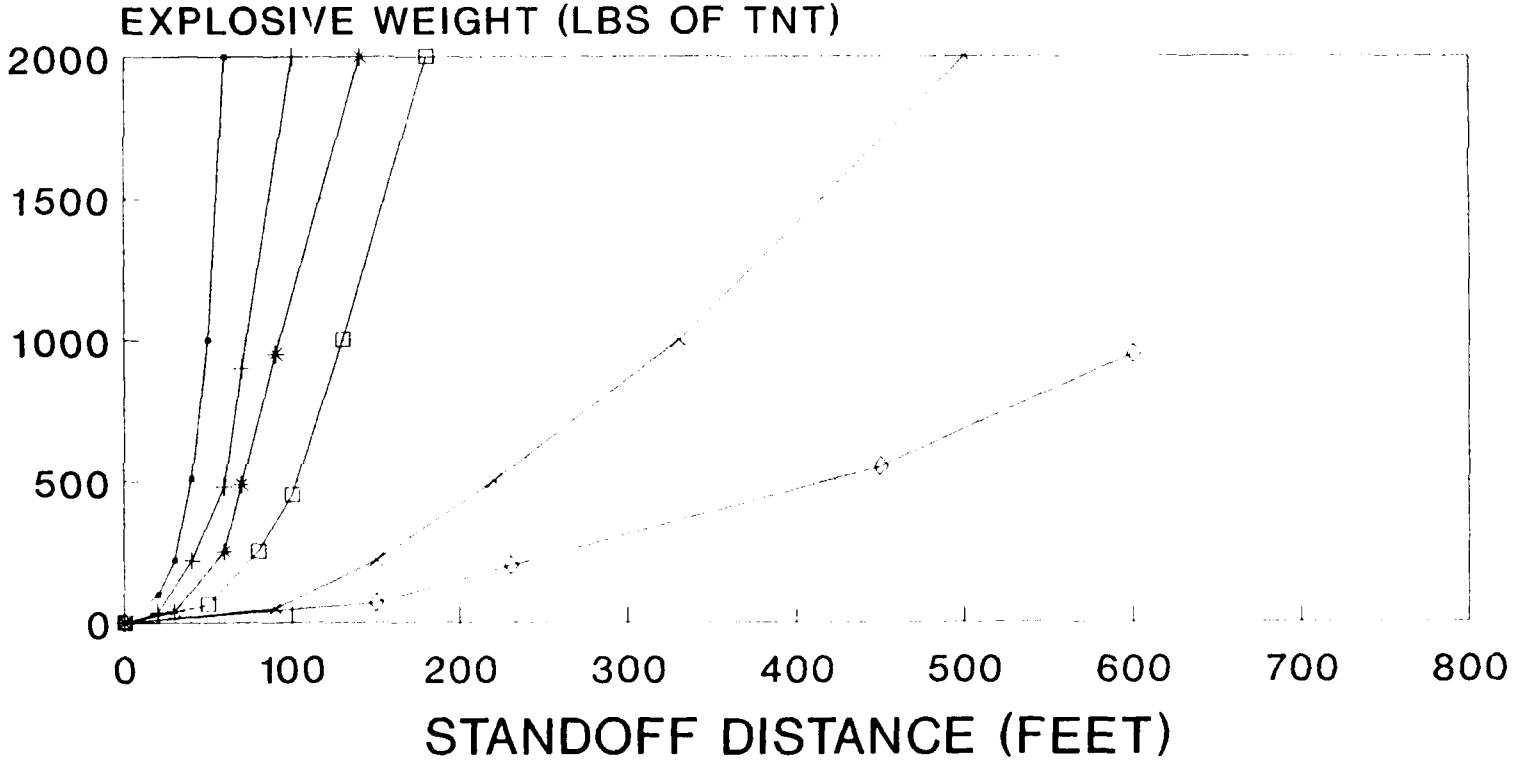
Security Engineering Manual Data

LEVELS OF PROTECTION
8" REINFORCED CONCRETE WALL



Security Engineering Manual Data

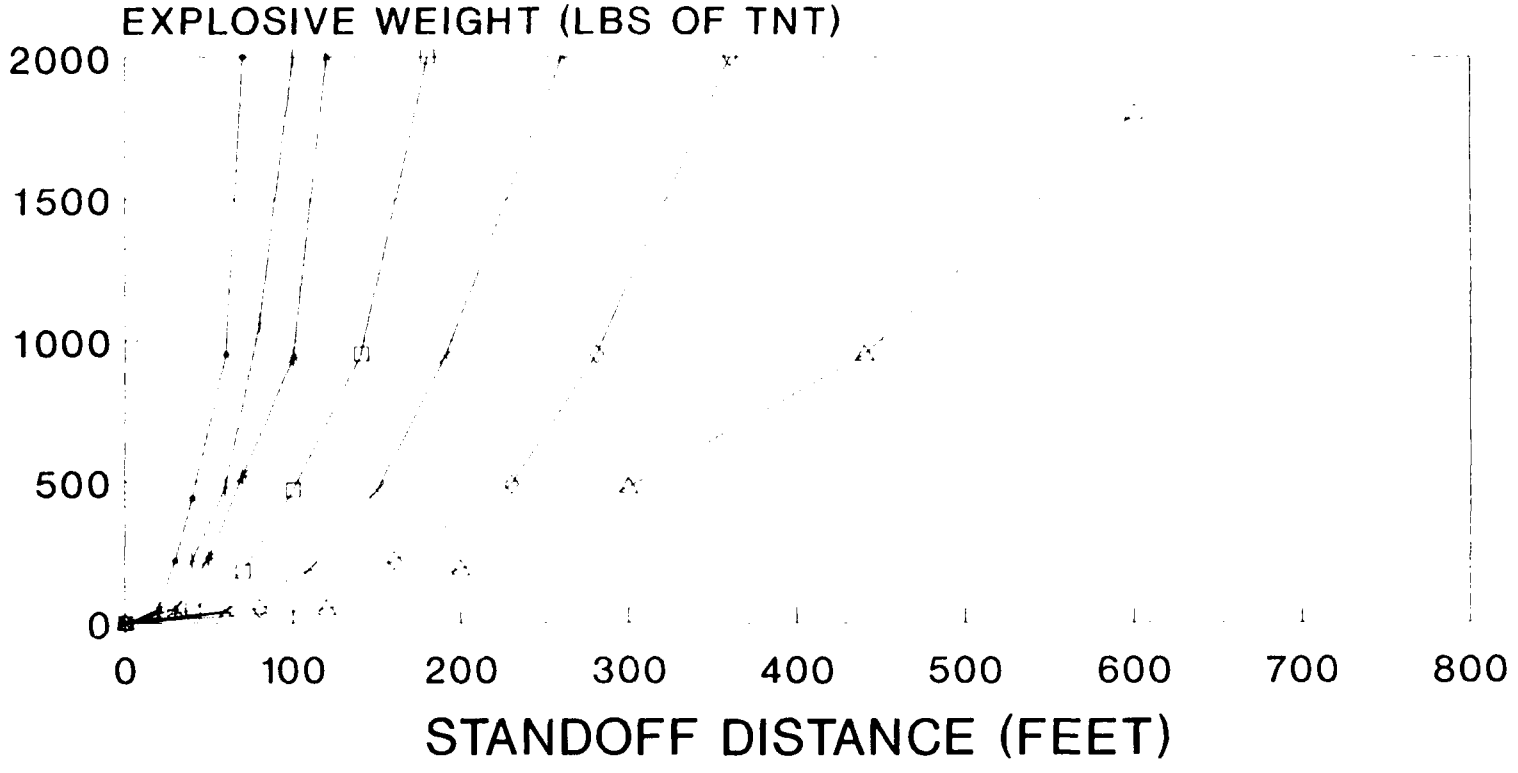
EXPLOSIVE EQUIVALENT STATIC PRESSURE
DOOR DESIGNED FOR EXPLOSIVES EFFECTS



Security Engineering Manual Data

THERMINALLY TEMPERED GLASS THICKNESS

28x42 WINDOW DESIGNED FOR EXPLOSIVES



Security Engineering Manual Data

EXTERIOR BASE CASE DESIGN REQUIREMENTS FOR MEDIUM LEVEL PROTECTION AGAINST 2000# EXPLOSIVE

TYPE CONSTRUCTION	BARRIER STANDOFF	DOOR DESIGNED FOR STATIC PRESSURE	28 x 42 WINDOW
PLAIN MASONARY WALL- 8" THICK	600'	4 psi (-5.5T FORCE)	3/8" THERMALLY TEMPERED GLASS
MODERATE REINFORCED CONCRETE BLOCK WALL- 8" THICK	270'	12 psi	1/2" THERMALLY TEMPERED GLASS
MODERATE REINFORCED POURED CONCRETE WALL- 8" THICK	175'	25 psi	1" W/ POLYCARBONATE LAMINATE

INTERIOR THREAT

EXPLOSIVE:	UP TO 50# TNT EQUIVALENT
CONVEYANCE:	SATCHEL, BACK PACK, SUPPLIES
PURPOSE:	DESTRUCTION

INTERIOR BASE CASE DESIGN REQUIREMENTS FOR MEDIUM LEVEL PROTECTION AGAINST 50# EXPLOSIVE

(ASSUMES ADEQUATE VENTING TO MINIMIZE REINFORCEMENT)

TYPE CONSTRUCTION	STANDOFF DISTANCE	DOOR DESIGNED FOR STATIC PRESSURE
28" THICK HEAVILY REINFORCED CONCRETE WALL	ZERO W/ NO TAMPING	EQUIVALENT TO 28" WALL THICKNESS
6" THICK MODERATELY REINFORCED CONCRETE WALL	52'	12 psi
4" THICK MODERATELY REINFORCED CONCRETE WALL	92'	4 psi

Security Engineering Manual and
Barriers Technology Handbook Data

MAIL BOMB THREAT

EXPLOSIVE:	UP TO 2# TNT EQUIVALENT
CONVEYANCE:	POSTAL/DELIVERY SERVICES, SUPPLIES
PURPOSE:	INDIVIDUAL ATTACK
DEFENSIVE MEASURES:	BUILDING LAYOUT VENTED WALLS, DOORS, WINDOWS DETECTION EOD CONTAINER

BASED UPON AVAILABLE TECHNOLOGIES, THE POTENTIAL FOR ALTERNATIVE OPERATIONAL PROCEDURES AND EXPECTED HIGH COST IN R&D RESOURCES, AN R&D PROGRAM FOR DEALING WITH THE MAIL BOMB THREAT IS NOT CONSIDERED WARRANTED AT THIS TIME.

APPENDIX C

List of Sources for Physical Security Barriers

5-31-91

PHYSICAL SECURITY BARRIERS
LIST OF SOURCES

1 (#)/ TITLE
2 AUTHOR/ GVT. AGENCY/ CORPORATION
3 DOCUMENT NO.
4 DATE
5 IMPORTANT PAGES
6 DESCRIPTION,TOPICS

1 (1)/ **BARRIERS**
2 MOELLER,C./ NRC/ -
3 -
4 07-04-77
5 -
6 FENCES, BARBED TAPES, LOCKS

1 (2)/ **DESIGNING FOR SECURITY**
2 -/ ARMY DEPT./ -
3 TM 5-853-1
4 15-08-83
5 1.2, 2.6, 4.7, A.1, C.1
6 BARRIERS,SECURITY

1 (3)/ **BARRIER TECHNOLOGY: PERIMETER BARRIER PENETRATION TESTS**
2 KODLICK, M./ SANDIA LAB./ -
3 SAND78-0241
4 01-01-79
5 32,INSIDE FRONT CVR
6 BARRIERS, TESTS OF BARRIER FENCES PERFORMED

1 (4)/ **ANALYSIS & TESTING RQMTS FOR PERIMETER BARRIER & LIGHTING DEVLPMT**
2 FINEBERG, M./ BELVOIR RD&E/ BDM
3 W-79-450-TR
4 01-10-79
5 -
6 BARRIER LIGHTING

1 (5)/ **CATALOG OF PHYS. SEC. EQUIP.: BK 1, VOL.1, BARRIERS & STRUCT. COMPONENTS**
2 HABERMAN, W./ NRC/ MITRE CORP.
3 PB-287 107
4 01-06-77
5 -
6 BARRIER DESCRIPTIONS

1 (6)/ **PHYSICAL SECURITY AND LOSS PREVENTION**
2 -/ NAVY DEPT./ -
3 OPNAVINST 5530.14A
4 16-09-85
5 CHAPTER 6
6 BARRIERS, SECURITY, THREAT TYPE, NAVY MANUAL ON SECURITY

1 (7)/ **THE SECURITY / FIRE EQUIPMENT MANUFACTURERS' DIRECTORY**
2 ANDERSON, H./ -/ MARKETING DEVELOPMENT
3 617-369-5382
4 01-05-77
5 13
6 -

1 (8)/ **SECURITY SYSTEMS APPLICATIONS**
2 SIATT, W./ -/ -
3 -
4 01-04-80
5 -
6 BUILDING, HOSPITAL SEC./ SEPARATE ARTICLES ON DIFFERENT SECURITY SITUATIONS

1 (9)/ **POWER PLANT SECURITY**
2 BEVILACQUA, F./ -/ AMERICAN NUCLEAR SOCIETY
3 -
4 05-10-80
5 1
6 POWER PLANT SEC.

1 (10)/ **PHYSICAL SECURITY**
2 -/ NAVY DEPT./ -
3 NAAVFAC DM-13.1
4 01-03-83
5 -
6 BARRIERS, NAVY PHYSICAL SECURITY MANUAL

1 (11)/ **SECURITY HANDBOOK**
2 -/ -/ EDISON ELECTRIC INSTITUTE
3 73-16
4 01-03-73
5 4,31
6 EXTERIOR/INTERIOR SECURITY, INDUSTRIAL SECURITY MANUAL

1 (12)/ **BARRIER PENETRATION DATABASE. REVISION 1**
2 FAINBERG, A.\ NRC\ BROOKHAVEN NATL. LAB.
3 PB-292 981
4 01-11-78
5 26,7-25
6 FENCES, DOORS, PENETRATION TIMES FOR BARRIERS

1 (13)/ **PHYSICAL PROTECTION OF NUCLEAR FACILITIES**
2 -/ NRC/ NUSAC, INC.
3 -
4 01-02-77
5 -
6 PHYSICAL SECURITY PLAN

1 (14)/ **PHYSICAL SECURITY**
2 -/ ARMY DEPT. / -
3 FM 19-30
4 01-03-79
5 CHAPTER 5
6 BARRIERS, SECURITY

1 (15)/ **GENERAL-PURPOSE, BARBED-TAPE OBSTACLE**
2 STANLEY, A./ BELVOIR RD&E/ -
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4 01-04-68
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6 BARBED TAPE EFFECTIVENESS SHOWN

1 (16)/ **A SYSTEMATIC APPROACH TO THE CONCEPTUAL DESIGN OF PHYS. PROTECTION SYSTEMS FOR NUCLEAR FACILITIES**
2 -/ ENERGY DEPT./ -
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4 01-05-78
5 CHAPTER 3
6 PHYS. PROTECTION NUCLEAR FACILITIES

1 (17)/ **BARRIER PENETRATION TESTS**
2 MOORE, R./ NBS/ -
3 NBSTN-837
4 01-06-74
5 -
6 WALLS, FENCE,SHOWS RESULTS OF BARRIER PENETRATION TESTS

1 (18)/ **CATALOG OF SECURITY EQUIPMENT**
2 FETCHER, J./ NBS/ -
3 NBSSP-480-35
4 01-11-78
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6 CATALOG OF SECURITY EQUIPMENT SUPPLIERS

1 (19)/ **BARRIER TECHNOLOGY HANDBOOK**
2 -/ DOE/ -
3 SAND77-0777
4 01-07-82
5 -
6 BARRIERS, PENETRATION TIMES, OVERALL VIEW OF BARRIER TYPES

1 (20)/ **SANDIA BARRIER REFERENCE GUIDE**
2 -/ DOE/ -
3 -
4 01-01-85
5 -
6 DESCRIBES AND ILLUSTRATES MOST BARRIER SYSTEMS

1 (21)/ **ARMS ROOM RESPONSE SYSTEMS**
2 -/ ARMY DEPT./ -
3 -
4 15-10-71
5 C-1,7 TO 57
6 8 CANDIDATE SYSTEMS SELECTED FOR ARMS ROOM PROTECTION (I.E. TEAR GAS, GUARD DOGS, ELECTRIC FENCE)

1 (22)/ **INTRUDER DELAY SYSTEM INCORPORATING LIGHT AND SOUND (FINAL)**
2 SHARP, B./ BELVOIR RD&E/ WYLE RESEARCH
3 WR 84-37
4 01-07-84
5 -
6 SOUND, LIGHT, USING SOUND AND LIGHT TO DELAY INTRUDERS

1 (23)/ **SYMPOSIUM ON SECURITY TECHNOLOGY #2**
2 -/ -/ ADPA
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6 BLAST PROTECTIVE WALLS, VEHICLE BARRIERS, THREAT

1 (24)/ **SYMPOSIUM ON SECURITY TECHNOLOGY #3**
2 -/ -/ ADPA
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4 30-04-87
5 157, 163, 167
6 ARMY WEAPONS ACCESS DELAY SYSTEM (WADS), CONCERTINA BLANKET, Z-CAGE/ VENTED SUPPRESIVE SHIELDING (VSS)/ PHYSICAL SECURITY ENHANCEMENT PROGRAM (PSEP)

1 (25)/ **SYMPOSIUM ON SECURITY TECHNOLOGY #4**
2 -/ -/ ADPA
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5 58, 96, 104, 109, 116, 127, 136, 164
6 TERRORISM, ARCHITECTURE AND SECURITY, COMPUTER-BASED PHYS. SEC. DESIGN

1 (26)/ **SYMPOSIUM ON SECURITY TECHNOLOGY #5**
2 -/ -/ ADPA
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4 09-06-89
5 33, 112, 192, 205
6 THREAT, FOAM, FLEXIBLE BARRIERS

1 (27)/ **SYMPOSIUM ON SECURITY TECHNOLOGY #6**
2 -/ -/ ADPA
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4 14-06-90
5 1, 8, 47, 239, 273
6 THREAT

1 (28)/ **PROTECTION OF ASSETS: VOLUME I**
2 WALSH, T./ -/ MERRIT COMPANY
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4 01-01-87
5 CHAPTER 3
6 BARRIERS

1 (29)/ **PROTECTION OF ASSETS: VOLUME III**
2 WALSH, T./ -/ MERRIT COMPANY
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4 01-01-89
5 CHAPTER 18,19
6 THREAT, TERRORISM, PHYSICAL SEC. PLANNING

1 (30)/ **ACTIVE RESPONSE PERIMETER BARRIER CONCEPTS**
2 CARTER, C./ BELVOIR RD&E/ BDM
3 BDM/W-81-739-TR
4 01-12-81
5 -
6 TEAR GAS, FOAM, ELECTRIC FENCES AND OTHER ACTIVE RESPONSE B. INVESTIGATED

1 (31)/ **RESPONSE/DETERRENT SYSTEMS**
2 BONICH, R./ BELVOIR RD&E/ -
3 1473
4 01-01-82
5 -
6 BARRIER RESPONSE SYSTEMS (I.E. FOAM, SOUND, LIGHT, NITINOL, ETC.)

1 (32)/ **DEVLPMT OF A DRAFT PHYS. SEC. MILITARY STANDARD FOR DCS FACILITIES**
2 GIESKE, H./ HDL/ BOOZ, ALLEN & HAMILTON INC.
3 HDL-CR-81-0095-1
4 01-12-81
5 -
6 PHYSICAL SECURITY MEASURES INCLUDING BARRIERS AT DCS FACILITIES

1 (33)/ **DEVLPMT OF SEC. MEASURES: IMPLEMENTATION INSTRUCTIONS FOR MIL-STD**
2 OTTEN, M./ HDL/ BOOZ, ALLEN & HAMILTON INC.
3 HDL-CR-81-024-1
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1 (34)/ **FIRST DEFENCE BARRIER EXPLORATORY PENETRATION TESTS**
2 DEBOESER, E./ DNA/ BDM
3 DNA-TR-89-233
4 10-05-90
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6 CURVED FENCES, BRC WELDFENCE 358

1 (35)/ **TERRORISM IN THE U.S. AND THE POTENTIAL THREAT TO NUCLEAR FACILITIES**
2 HOFFMAN, B./ DOE/ RAND CORP.
3 R-3351-DOE
4 01-01-86
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6 THREAT: NATIVE TERRORIST GROUPS

1 (36)/ **RETA CO. DATA & IAB'S (INTERIOR ACTIVATED BARRIERS)**
2 COOK, B./ -/ RETA CO.
3 -
4 --/--/--
5 -
6 PACKET OF INFO ON STICKY FOAM (FOIL) AND COLD SMOKE (VOID)

1 (37)/ **ATTACK RESISTANT WALLS - PRELIMINARY TESTS**
2 ODELLO, R./ DNA/ CIVIL ENG. LAB.
3 TN-1508
4 01-12-77
5 -
6 WALL REINFORCEMENTS, ATTACK TOOLS

1 (38)/ **DNA MAGAZINE DOOR RELOCKING HARDWARE DEVELOPMENT**
2 SELF, H./ DNA/ CIVIL ENG. LAB.
3 N-1559
4 01-06-79
5 -
6 INSTANT DOOR RELOCKERS

1 (39)/ **JOINT SERVICES PERIMETER BARRIER PENETRATION EVALUATION**
2 FITE, R./ BELVOIR RD&E/ -

3 2208
4 01-04-77
5 -
6 PERIMETER FENCE PENETRATION TIMES

1 (40)/ **FORCED ENTRY RESISTANT DOORS FOR ORDINANCE STRUCTURES**
2 COOK, G./ NAVY DEPT./ -
3 TM-64-79-18
4 01-12-79
5 -
6 DOOR REINFORCEMENT

1 (41)/ **THE THREAT TO LICENSED NUCLEAR FACILITIES**
2 BRENNAN, C./ NRC/ MITRE CORP.
3 MTR-7022
4 01-09-75
5 -
6 TERRORIST THREAT - DETAILED BUT OUT-OF-DATE

1 (42)/ **DISORDERS AND TERRORISM**
2 FOOTE, J./ NATL. ADVISORY COMMITTEE ON CRIMINAL JUSTICE STAND. & GOALS/ -
3 -
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5 CHAPTERS 1, 2, 6.9
6 THREAT: TERRORISM, CIVIL DISTURBANCES, PHYSICAL SECURITY

1 (43)/ **INTERNATIONAL AND TRANSNATIONAL TERRORISM: DIAGNOSIS & PROGNOSIS**
2 -/ CIA/ -
3 PR 76 10030
4 01-04-76
5 -
6 THREAT

1 (44)/ **THREATS & INCIDENTS INVOLVING NUCLEAR MATERIAL OR FACILITIES**
2 -/ NRC/ -
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4 01-01-75
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6 THREAT: ACTUAL CASES OF ATTACKS AND INCIDENTS

1 (45)/ **PHYSICAL SECURITY AND SAFETY**
2 -/ -/ ASIS (AMERICAN SOCIETY FOR INDUSTRIAL SECURITY)
3 -
4 01-05-76
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6 LOCKS

1 (46)/ **FEDS SMOKE DISPERSION**
2 PAXON, L./ DNA/ AMERICAN SERVICE PRODUCTS, INC.
3 DNA 5064F
4 31-08-79
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6 SMOKE

1 (47)/ **THREAT STATEMENT FOR ARMY MATERIEL COMMAND (SECRET/NOFORN)**
2 -/ ARMY DEPT./ -
3 89087
4 27-11-89
5 -
6 THREAT

1 (48)/ **ARMY THREAT STATEMENT FOR PHYSICAL SECURITY (SECRET)**
2 -/ ARMY DEPT./ -
3 87:072
4 27-12-84
5 -
6 THREAT

1 (49)/ **FLUIDIC DOOR-LOCKING SYSTEM**
2 GOES, M./ ARRADCOM/ -
3 ARLCD-TR-82019
4 01-01-83
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6 IGLOO DOOR LOCKING SYSTEM

1 (50)/ **NAVY LOCK AND KEY CONTROL GUIDE (ASHORE)**
2 -/ NAVY DEPT./ -
3 AD-B127 956
4 06-01-88
5 -
6 LOCKS

1 (51)/ **THE UNIQUE NONMAGNETIC NITONOL ALLOYS**
2 BUCHLER, W.
3 33-216
4 --/--/--
5 -
6 NITINOL ALLOY 'MEMORY METAL' (PACKAGE OF PAPERS)

1 (52)/ **A PROCEDURE TO INTEGRATE PROTECTIVE MEASURES OVER A RANGE OF TERRORIST AND CRIMINAL THREATS - FROM THE 1990 CARNAHAN CONFERENCE ON SECURITY TECHNOLOGY**
2 BETTS, C./ U.S. ARMY CORPS OF ENGINEERS/ -
3 -
4 04-04-90
5 -
6 THREAT

1 (53)/ **ASSESSMENT OF SPECIAL PURPOSE FORCES THREAT TO AIR BASES IN THE ROK (SECRET)**
2 -/ ENGR. STUDY CENTER/ -
3 -
4 03-01-83
5 -
6 AIR AND WATER THREATS TO SOUTH KOREAN AIR BASES. RESULTS INCLUDED - DAMAGE/LOSS OF USE ANTICIPATED.

1 (54)/ **BASE & INSTALLATION SECURITY SYSTEM (BISS), MRM-1000 PERIMETER SECURITY SYSTEM QUALIFICATION TEST & EVALUATION (QT&E) (CONF)**
2 -/ MUNITIONS SYSTEMS DIVISION, AIR FORCE SYSTEMS COMMAND/ -
3 MSD-TR-89-63
4 10-01-89
5 -
6 MRM 1000 DOUBLE COIL, STAINLESS STEEL, BARBED TAPE OBSTACLE WITH COAXIAL SENSING CABLE ENCLOSED INSIDE THE CENTER BARBED TAPE - DID NOT MEET PD SPECS.

1 (55)/ **FLUIDIC SECURITY SYSTEMS FOR BUNKERS & STORAGE AREAS (CONF)**
2 -/ PICATINNY ARSENAL/ MASLY & GORE
3 -
4 01-01-76
5 -
6 FLUIDIC CONTROL SYSTEM FOR LOCKING DEVICE. ADEQUATE BUT NEEDS FURTHER DEVELOPMENT FOR PARTICULAR BUNKER DESIGN AND SUCCESS REQUIREMENTS.

1 (56)/ **EVALUATION OF PROTOTYPE FENCES (CONF)**
2 BONICH, R./ MERADCOM/ -
3 2323
4 11-03-80
5 -
6 FIVE PROTOTYPE FENCES FABRICATED AND TESTED TO DETERMINE RESISTANCE TO CLIMBOVER AND PENETRATION BY SKILLED AND DETERMINED INTRUDERS. CHAINLINK, EXPANDED METAL AND STEEL PICKETS.

1 (57)/ **SECURITY ENGINEERING MANUAL**
2 -/ US ARMY CORPS OF ENGINEERS/ -
3 -
4 01-01-90
5 -
6 THREAT, VEHICLE BOMBS, EXTERIOR ATTACK, FORCED ENTRY, MAIL BOMBS, AIRBORNE OR WATERBORNE CONTAMINATION; SUITABLE BARRIERS TO THESE THREATS.

1 (58)/ **TERRORIST VEHICLE BOMB SURVIVABILITY MANUAL (VEHICLE BARRIERS)**
2 -/ NAVY DEPT./ -
3 ZZ65
4 03-01-86
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6 VEHICLE BARRIERS, BLAST RESISTANT GLAZING

1 (59)/ **DISCUSSION OF THE FULL SCALE CRASH TESTS OF THE DELTA MODEL TT210 BOLLARD SYSTEMS**
2 -/ -/ DELTA SCIENTIFIC CORPORATION
3 -
4 02-13-86
5 -
6 BOLLARD ACTIVE VEHICLE BARRIER SYSTEM

1 (60)/ **WATERBORNE INTRUSION PHYSICAL BARRIERS FOR DEFENSE OF WATERFRONT FACILITIES**
2 R. D. RAIL/ NAVY DEPT./ -
3 M-44-81-8
4 01-07-81
5 -
6 WATER BARRIERS

1 (61) **STRUCTURES TO RESIST THE EFFECTS OF ACCIDENTAL EXPLOSIONS**
2 -/ ARMY, NAVY, AIR FORCE DEPTS./ -
3 TM 5-1300, NAVFAC P-397, AFM 88-22
4 06-15-69
5 -
6 EXPLOSIONS

1 (62) **IMPACT OF SABOTAGE ON DEFENSE COMMUNICATIONS SYSTEM FACILITIES: PHASE I**
2 H. A. GIESKE/ HARRY DIAMOND LABORATORY/ -
3 HDL-TM-76-34
4 12-01-76
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6 THREAT, BARRIERS

1 (63) **IMPACT OF SABATOGE ON MANNED DCS FACILITIES, TASK I. SURVEY AND ANALYSIS**
2 M. B. GINSBERG/ HARRY DIAMOND LABORATORY/ -
3 HDL-TM-78-1
4 11-01-78
5 -
6 THREAT

1 (64) **AIR BLAST TABLES - DATA FROM SPHERICALLY DETONATED PENTOLITE CHARGES**
2 S. D. SCHLUETER/ ARMY DEPT. (ARRADCOM)/ -
3 ARBRL-TR-02304
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5 -
6 EXPLOSIVE AIR BLAST TABLES

APPENDIX D

Military Physical Security Barrier System Survey and Questions for Industry, November 1990

PART I

MILITARY PHYSICAL SECURITY BARRIER SYSTEMS

NOVEMBER 1990

PRODUCT MANAGER FOR PHYSICAL SECURITY EQUIPMENT

US ARMY BELVOIR RESEARCH, DEVELOPMENT AND ENGINEERING CENTER

FORT BELVOIR, VIRGINIA 22060

MILITARY PHYSICAL SECURITY BARRIER SYSTEMS

INDUSTRY SURVEY

INTRODUCTION: As the threat to critical military assets and personnel changes from the high intensity to low intensity conflict, physical security barrier systems will be required to augment electronic security measures by providing intruder deterrence and delay. The nature and degree of the threat to critical military assets and personnel varies with respect to geographic locations, level of hostile intent, and vulnerability of the target. Targets range from personnel and equipment to nuclear and chemical materials. The threat can range from unskilled to highly skilled intruders depending on their resources and motivation.

Barriers are but one of the four elements which must react in a timely manner to form the foundation for an effective physical protection system. *Detection and Assessment* systems must detect and verify any unauthorized intrusion attempt by outsiders or any serious adverse acts by insiders or outsiders. *Communication* systems must ensure that all pertinent information is transferred to the point(s) where appropriate decisions can be made and actions initiated. *Delay* systems (barriers) must impede continued adversary penetration into, or exit from, the area being protected. *Response* systems, or forces, must counteract adversary activity and neutralize the threat. The only way to achieve denial of unauthorized access is through the application and integration of these major components of a physical security system. Each element is equally important and none of them can be eliminated or compromised if an effective physical protection is to be achieved. **The focus of this effort however is on the *delay* facet of physical security systems.**

The role of barriers is to increase the adversary task time that remains after the detection system sensor is triggered. Often a barrier will also cause an increase in threat activity and exposure time, thus increasing the probability of detection. This increase in task time is accomplished by introducing sufficient impediments along possible adversary paths to provide sufficient delay for the response forces to respond.

THREAT ENVIRONMENT: The decision to implement and maintain a physical security system is made from the realization that there is a threat against which assets must be protected. Terrorism, violent protest and the inherent unpredictability of low-intensity conflict significantly compound the complexity of today's physical security tasks. Weapons proliferation, increased use of

THREAT LEVEL	THREAT DESCRIPTION	LIKELY THREAT TYPES
Basic	Outsiders alone or in groups; insiders working alone or in association with other insiders.	Casual intruders; less radical demonstration groups; pilferers/thieves.
Intermediate	Outsiders, alone or in small groups; insiders working alone; intruder with some knowledge or familiarity with the security system.	Well-organized, radical, and violent demonstrations; organized crime; white collar crime; lower-level espionage agents and stand-off surveillance; some terrorists.
Advanced	Outsiders working alone or in collusion with an insider; knowledgeable, skilled, or semi-skilled intruders without penetration aids.	Sophisticated espionage; some terrorists; paramilitary forces; highly organized and skilled criminal elements.
Maximum	Outsiders in well organized and trained groups working alone or with assistance from insiders; knowledgeable, skilled, and well equipped intruders who can use sophisticated and portable penetration aids.	Special purpose forces; some terrorist and paramilitary elements; highly trained or sophisticated espionage agents and methods.

Figure 1: Threat Capability Level.

sophisticated explosives and timing mechanisms, and greater use of stand-off weapons portend a more complex physical security task in the future. Further compounding the physical security planning process is the near impossibility of attributing any "universality" to the threat environment.

This questionnaire will concentrate on the "peacetime" and "transition to war" threat environments, and does not consider full scale conflict with its accepted lethality and tactical forces. Although the general threat environment may be one of peace, a local or regional crisis may place vulnerable US assets in a more serious threat situation. Figure 1, Threat Capability Level, reflects that the threat today is not only dynamic, but also can be area and asset specific.

Adversaries have the option of using force, stealth or deceit, or any combination of these tactics from any direction at a time they choose. This barrier evaluation program is primarily directed towards force and stealth. *Entry-control systems address deceit.* The threat goals may range from attacks against US personnel to sabotage or theft of equipment or materials.

The time it takes an adversary to penetrate a "secure area" is a direct reflection of his motivation, the selected attack mode which is governed by equipment available and the barrier systems employed. The arsenal of attack mechanisms include:

* **Hand tools** - sledges, axes, bolt cutters, wrecking bars, metal cutters, etc.

* **Powered hand tools** - hydraulic bolt cutters, abrasive saws, electric drills, rotohammers, etc.

* **Thermal cutting tools** - oxyacetlene torches, oxylances,etc.

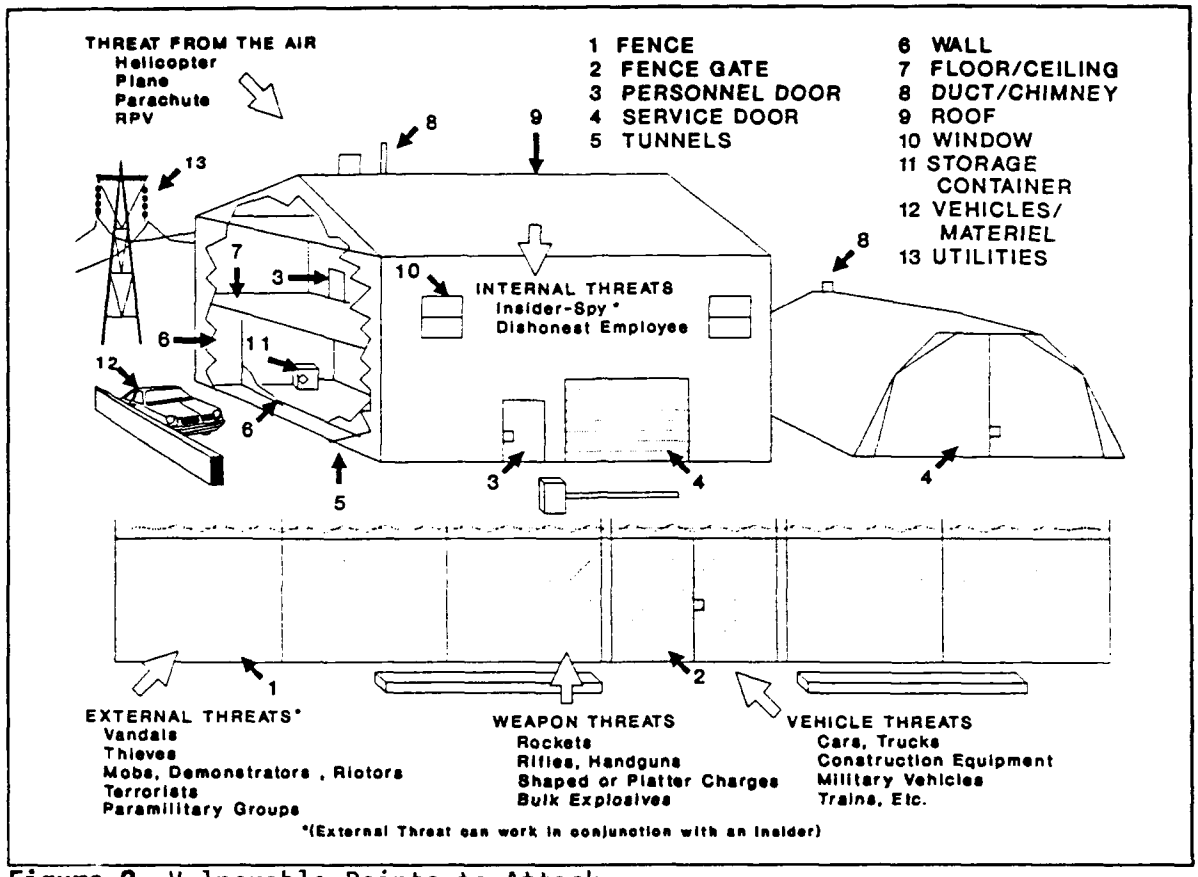

Figure 2: Vulnerable Points to Attack.

* **Explosives** - bulk, linear and conical shaped charges, platter charges, etc.

* **Vehicles** used as rams and cargo carriers.

* **Direct fire stand-off weapons** - rifles, handguns, rockets, etc.

The threat today has never been greater or more complex. This magnitude and complexity stem from the number of potential threats that exist, their sophistication, capabilities, expertise, and the unpredictability of their willingness or intent to operate against an asset to be protected. Any attempt to assess the seriousness of a threat must examine threat identity, access, intent, capabilities, and willingness to be caught or killed.

THE PROBLEM: In order to be responsive to world-wide commitments, the US military requires a range of physical security barrier and barrier enhancement systems to protect and secure its personnel and equipment. Selection of a specific barrier package must reflect both the criticality of the asset being secured and the potential threat. Physical protection must be provided by barriers that are carefully planned and positioned in the path of the adversary. The degree of delay afforded depends upon the nature of the obstacles employed.

In an environment of escalating terrorist activity, most security barriers at typical US military/industrial facilities (traditional fences, buildings, doors, locks, etc.) may present very little deterrence or delay. The concept of delay is very important. Each additional minute required by the adversary provides time for the response force to interrupt the action. A few minutes of delay may have a significant effect. Tests have shown that even structural barriers which have an appearance of impenetrability can be breached rapidly by well equipped and determined intruders.

For both new construction and the upgrade of existing facilities, the military draws upon a wide variety of commercial physical security barrier systems and components. Types and locations of barriers available are shown in Figure 3. Barrier systems must be designed in depth, increasing in dimension with the threat and criticality of the secured "item", and the delay time required for a response to be mounted. Important points in barrier design include:

* Cost effectiveness depends on level of threat and importance/value of target.

* One weak link in a barrier system may negate the value

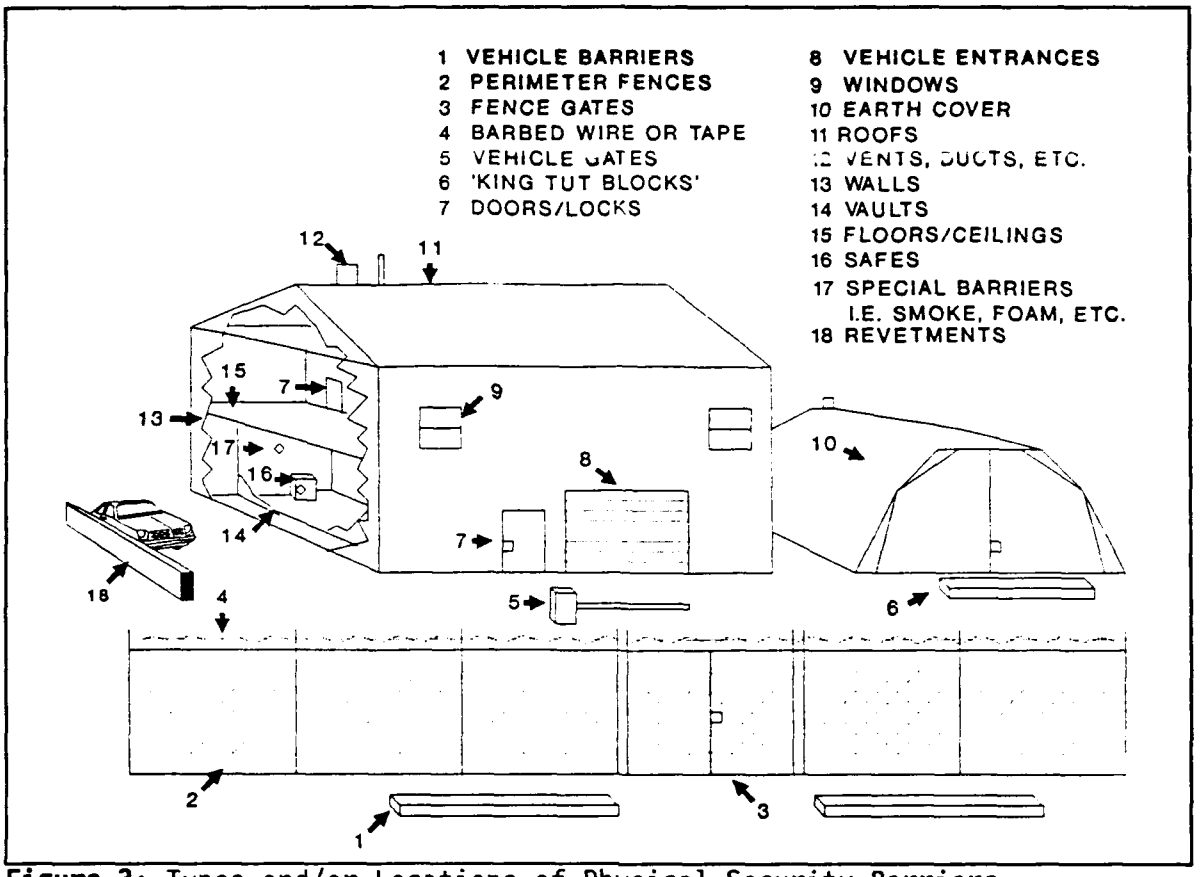

Figure 3: Types and/or Locations of Physical Security Barriers.

of the strong links.

* Integration with guard and sensor systems is required.

* No barrier is impenetrable - delay time is the principal consideration.

* Barriers should be safe and not seriously hurt either friend or foe without warning and/or man in loop making decisions.

* Barriers should have minimal or no impact on the normal operations of the facility.

THE SOLUTION: The Product Manager for Physical Security Equipment, US Army Belvoir Research, Development and Engineering Center, Fort Belvoir, Virginia, is considering the formulation of a DOD "BARRIER APPLICATION SYSTEM RESEARCH, DEVELOPMENT, TEST AND EVALUATION (RDT&E) PROGRAM." The purpose of this program is to identify active and passive barrier components needed to provide adequate physical security systems for securing and protecting US personnel and equipment (e.g. dynamic barriers to stop forced vehicle entry at check points, denial mechanisms for exterior and interior doors and windows, etc.), and where required, to initiate a plan of action addressing shortfalls and deficiencies of existing physical security barrier systems. Systems designed to resolve deficiencies would involve the early demonstration of technology available in the private sector to military applications, and will focus on the Military Adaptation of Commercial Items (MACI) and concept exploration.

This survey has three purposes:

(1) present a view of military physical security barrier requirements,

(2) develop an understanding of current state of the art, and

(3) determine how technology developed in the civilian sector may be applied to military requirements.

The decision to embark on a Barrier Application System RDT&E program will be based, in part, on response to this survey.

<u>This survey is intended for information and planning purposes only. **It is not a request for proposals.** The Government does not intend to award a contract on the basis of responses submitted, but will compare the merits of all responses received and will incorporate barrier concepts offering the most promise into its</u>

overall barrier program plan to support the US military well into the next century.

On a voluntary basis only at no cost to the Government, **individual companies are offered the opportunity to suggest barrier system concepts, and to explain how their commercially available equipment or development ideas can support those concepts.** This opportunity for input will ensure that their capabilities have been considered in the development of a DOD Barrier Application System RDT&E Program.

PART II

QUESTIONS FOR INDUSTRY

RELATED TO

MILITARY PHYSICAL SECURITY BARRIER SYSTEMS

PRODUCT MANAGER FOR PHYSICAL SECURITY EQUIPMENT

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PHYSICAL SECURITY BARRIER SYSTEMS

QUESTIONS FOR INDUSTRY

INTRODUCTION: The questions in this paper are intended to stimulate dialogue. They are generally related to the deficiencies of physical security barrier equipment and materials currently used for military applications. These deficiencies may be addressed in whole or in part; partial solutions are as acceptable as total solutions. For example, if you have a solution for increasing the time required to breach the perimeter fence, but can not solve the arms room door problem, we still want to hear about the improved fence system. What does your firm have, or what might be developed, to improve physical security barriers?

The results of this survey will be used to determine if innovation and technology in the private sector is sufficiently advanced to justify a *Barrier Application System Research*, Development, Test and Evaluation Program. Such a program will focus on acquiring active and passive barrier components needed to provide adequate physical security systems for worldwide protection of US personnel and equipment.

1. **PERIMETER BARRIERS:** Perimeter barriers form the outermost protective element of a physical security system and function to exclude unauthorized personnel from the area. Existing barriers, such as fences and gates, may not significantly delay a determined adversary; however, properly designed and positioned barriers could delay personnel and vehicles long enough for other elements of the physical protection system to detect, assess and respond. Improving the penetration resistance of gates and portals to resist stealthy and forcible penetration, without providing equivalent protection features for the entire perimeter, would not provide balanced perimeter hardness. Upgraded designs and advanced concepts for perimeter barriers are needed.

o Chain-link fencing enhanced with barbed wire/concertina/ GPBTO (General Purpose Barbed Tape Obstacle) is fairly standard for perimeter security. Short of lethal barriers, what other technology is available to slow a determined intruder?

o Could an expanded metal fencing material be developed that has razor sharp edges to discourage climbing or lifting?

o How can vehicle arresting systems be incorporated along fence lines without major reconstruction?

o Short of building a solid wall, how can standoff weapon effects be reduced or eliminated by perimeter barriers?

o How can perimeter fencing be hardened against bulk or shape charge explosive assault?

o How can pedestrian and vehicle gates be hardened to slow forced entry? Can these measures be easily defeated (eg. by-passed, hydraulic line cut, etc.)?

o How can a speeding threat vehicle(s) be stopped at an entry point that must remain open for normal traffic (erectable barriers, arresting nets, cables, etc.)?

o Can this be done without major reconstruction or disruption of the entry way? Explain.

o How can massive concrete road barriers be moved in and out of position quickly without use of a fork lift or other heavy machinery?

o Can a vehicle be stopped by being sprayed with a substance to blind the driver, kill the engine, lock the wheels, or similar action?

o In order to be less obtrusive, is there a form of fast growing vegetation which can be used as an effective barrier to people? ..to vehicles? Explain.

o Is there a form of rolling or rotating barrier which inhibits movement across it?

o How could a moat be built up which incorporates sloping walls, difficult crests, and an impeding liquid center channel?

o Is there a form of "force field" (magnetic, microwave, etc.) which would deter movement? Explain.

2. WALLS, ROOFS AND FLOORS: The walls, roof and foundation of buildings, vaults and other structures are usually considered to be less vulnerable to penetration than are doors, windows, vents, and other conventional openings. Most walls, ceilings and floors, however, can be breached in a short time if the right tools are used, and may be the optimum path for forcible entry. Explosives are especially effective in producing holes large enough to crawl through. Upgrading existing structures or new structural designs can significantly extend the penetration delay time against hand, power, or thermal tools. When explosives are used, upgrading or increasing the thickness of the structure elements usually results in moderate increases. The amount of required explosives increases exponentially with the thickness of the member to be breached. Upgrading or using advanced materials/designs can also force the attacker to selectively increase his tool requirements and to alter his methods of operation.

o How can reinforced concrete structures be constructed to be more blast resistant? What can be done to enhance existing structures?

o What could be added to structures to foul or burn cutting tools? .....to clog burning tools?

o What construction materials/additives are available that would react to the heat generated by thermal or abrasive cutting tools and refill the cut or produce voluminous dense smoke/noxious gas? If none are available, could they be developed?

o Are there any construction materials or techniques elastic enough to absorb the energy from an explosion?

o What substances could be added between or within walls (such as a special material placed in the holes in cement blocks)

to hinder and slow intruders (e.g. tar, sticky foam, high strength epoxy, etc.)?

o How could a material be bonded to masonry walls to provide a tough sandwich similar to laminated safety glass?

o Does a "reactive armor" material exist for use on fixed structures?

o How could a sensing material be developed which would act both as a deterrent and a means of announcing a penetration attempt?

o Is there a substance to line the inside of walls to improve blast strength and resistance to penetration?

3. DOORS, WINDOWS AND UTILITY PORTS: Penetration delay time through normal openings in static structures can be increased through the use of thicker and/or composite materials. Doors, windows and utility ports, however, due to their functional requirements and associated hardware impose design restrictions and are in many cases one of the weakest links in a structure. Many reinforced concrete buildings provide pedestrian access through commercial hollow core, steel doors and ventilation through standard heating/air conditioning ducts. The barrier value of the basic structure is relatively high, but it is weakened by the use of ordinary doors, frames and hinges which can be easily penetrated. Consequently, for barrier purposes, the principle of balanced design requires that doors, windows, etc. with associated frames, hinges, bolts, bars, screens, covers and locking mechanisms be strengthened to afford the same protection as is provided by the floors, walls and ceiling of the parent structure.

o How can standard pedestrian doors and associated hardware be designed or reinforced to provide a significant penetration resistance?

o What glazing materials are there available, or under development, that will not shatter, burn, or be easily cut with a demolition saw?

o How can artificial crystal making techniques be used to produce new stronger, tougher, harder glazing materials?

o How can a window grid or shutters be designed that would be self-sealing on command, or when impacted by a projectile or blast wave?

o What construction materials are there available that will violently react to heat and expand to seal the passage way?

- Are materials available that will react to heat, shock or explosive compression to produce dense smoke or noxious gas? How could they be developed?

- What doors or windows are available which can be rotated on command to form a durable portion of a wall?

- Is a tough-walled "air bag" available which can be expanded rapidly in reaction to an explosion or penetration?

- How can doors or windows be designed to deflect a blast towards a harmless location?

4. LOCKS AND LOCKING MECHANISMS: Locks are important elements in the overall delay system of a facility since they secure the movable portions of the barriers. In all applications, lock delay capability should match the penetration resistance of the secured barrier. The delay time provided by locking devices varies with the type and sophistication of the lock and associated hardware (hasps, bars, latches, dead bolts, etc.). All locking devices can be defeated and should not be depended upon as a stand alone means of physical protection.

o What hardened security locks are available that afford greater deterrence than the standard military issue combination locks?

o Can portable locking devices be programmed to respond to specific physiological characteristics of selected individuals with authorized access?

o Are locking devices available that automatically increase the security level if tampered with or given the wrong opening key or combination?

o Can magnetic locks be made to have extremely high resistance to forced openings?

o Is a simple multiple jamb engaging bolt system available for doors or windows?

o Does a revolutionary portable or fixed locking system exist which uses a new kind of unlocking media?

5. VAULTS, IGLOOS AND REVETMENTS: The concept that material deposited in a vault or igloo is secure from theft can be misleading since both can be penetrated in a variety of ways if the adversary has access, time and proper equipment. Vaults are usually located within a larger structure instead of being free standing. The term igloo describes a special-use building which is covered with earth overburden. Igloos are primarily arch-type structures of reinforced concrete or corrugated structural steel plate; the vertical end walls consist of reinforced concrete. The front wall extends above and beyond the sides forming a barricade to retain the earth overburden. The term *revetment* is used to indicate barriers constructed to protect personnel, vehicles or supplies and equipment from direct and indirect fire weapons. They can be free-standing structures such as revetments protecting helicopters and bulk supplies, or adjacent to existing walls to enhance the level of protection. (Construction questions applicable to buildings, doors, vents, etc. in Sections 2&3 above are in many cases applicable here also.)

o What soil additives are available or might be developed to harden the overburden of an igloo to delay attempted penetration?

o Is there a particular type of vegetation (thorns, heavy interlocking root system, dense foliage, etc.) which would enhance overburden or earthen barriers?

o How can "King Tut" and other massive door blocks be more easily moved when they are supposed to be moved without use of a fork lift or other external machinery, but still be immobile to threat forces?

o How can existing vault and igloo doors be hardened with out complete reconstruction?

- Could an "instant revetment" be prefabricated out of cheap, lightweight materials, erected in the field and then easily filled with a "miracle material" or ordinary sand, gravel or other bulk material? Would a bonding cement be needed or desirable?

- What research has been done on igloo dome shape to best withstand blast?

- Are there any mobile igloo or revetment devices which can be moved and filled on site, then emptied and moved again?

6. AIRBORNE INTRUSION DETERRENTS: Helicopter, small fixed-wing and STOL (short-takeoff-and-landing) aircraft pose a very significant threat of intrusion by adversaries and/or their escape with material. Regardless of whether they have powered flight capability, all types of airborne threats (parachutes, hang gliders, etc.) can be considered when used in conjunction with other vehicles.

- What is the best method of covering the protected area with utility poles and a wire grid mesh?

- What other passive means are available to deter an airborne threat?

- Given detection of an incoming airborne threat, how could smoke, strobe lights, laser beams, etc. be used effectively to thwart a landing?

- Could holograms be projected to provide the appearance of massive obstacles to landing (trucks, trees, boulders, fences, etc.)? How would they be projected?

- How could protective nets be erected quickly to stop incoming threats?

- Could any kind of "distortion field" be established to confuse/deter pilots?

- Can jamming be used to defeat aircraft electronics?

7. ARMOR: Armor can be broadly defined as any material used to protect personnel, equipment or structures from explosively propelled projectiles. Although armor is commonly thought of as heavy steel or aluminum alloy plates, many light weight synthetic and composite materials, as well as normal construction materials provide appreciable resistance to projectile penetration. The protection of personnel in vehicles, gate houses and inside buildings themselves form an important element in the military security problem.

o How can commercial type cars and trucks used by the military be hardened against penetration or blast without major overhaul?

o What "bullet proof" glass or laminates are available in replacement windows and doors for upgrading the security of existing facilities?

o What is the status of lightweight unobtrusive body armor developed for civilian uses?

o What quick response material is available to blast harden vehicles instead of using sand bags on the floor?

o Are Kevlar, or similar lightweight materials, available as unobtrusive (decorative) panels or screens to provide temporary protection for key personnel?

8. DISPENSABLE BARRIERS AND DETERRENTS: Physiological design factors can be used to deter, delay or disrupt adversaries. Deterrents (high intensity sound, flashing light, etc.) can be designed for direct interference with sensory and motor processes in addition to adding physical encumbrances. These deterrents also include visual obscurant and chemical agents which create a hostile environment. Actively dispensable denial materials are materials used to augment other physical security barriers by adding additional obstacles or hazards to the environment in order to defeat or delay adversaries. Materials suitable to accomplish this burdening might include rigid plastic foams, sticky plastic foams, sticky sprays, slippery sprays, or rubble piles.

- o How can a fast setting, rigid plastic foam be dispensed and contained until set to block door or passage ways?

- o How could holograms be used to distract/disorient/delay an intruder?

- o How can "sticky foam" be dispensed and best employed to secure sensitive equipment?

- o What compounds or methods are available to aid in the clean up of "sticky" or "slippery" sprays and foams?

- o What dispensable materials are available (e.g. MACE)?

APPENDIX E

Response to Survey on Physical Security Barriers

02/11/91

PHYSICAL SECURITY BARRIERS
RESPONSE TO BARRIER SURVEY

1 DOCUMENT #
2 NAME OF DEVICE/CONCEPT
3 PERSONNEL CONTACT
4 COMPANY/ADDRESS/PHONE NUMBER
5 DESCRIPTION
6 COMMENTS (QUESTIONS TO ASK DEVELOPER OF CONCEPT)
7 APPLICABLE REFERENCES

1 # 101
2 EXPLOSIVE NET BARRIER
3 JAMES E. WRIGHT
4 OCEAN TECHNOLOGY, INC.
2361 S. JEFFERSON DAVIS HWY.
SUITE 1006
ARLINGTON, VA. 22202
(703)-418-1344
5 A net made from a combination of fiber rope and extruded explosive. Will explode when triggered. Can be used as a perimeter barrier supplement to stop personnel, vehicles, or aircraft. Can be used indoors to supplement doors, windows, roofs, and floors. It is low cost, easily dispensable and portable. The degrees of effectiveness can be varied with the mesh size and the diameter of the extruded explosive.
6 Has it gone beyond the concept stage (has it been tested)?
After it explodes does it leave an opening?
How reliable are the explosives?
How lethal/dangerous would it be?
7 Indirectly answers Q-2,3,4,5,7,11,13

1 # 102
2 SMOKE AND FOAM
3 R. H. HILTZ AND S.S.GROSS
4 MSA RESEARCH CORPORATION
P.O. BOX 429
PITTSBURGH, PA. 15230
(412)-967-4237
5 Overview of dispensable smoke and foam technology. (Same as article in #26)
6 -
7 Q-13

1 # 103
2 **VARIOUS**
3 JEFF QUANTE
4 ROSS ENGINEERING COMPANY
104 N. MAPLE AVENUE
P.O. BOX 347
LEOLA, PA. 17540
(717)-656-2095
5 Gives answers and suggestions to many of the questions, including; VSS suppressive shielding, vehicle barriers, reinforced walls, doors, windows, locks, etc. Discusses Noviflex glazing in article from ADPA 1990 Symposium (Same as article in #27).
6 What are the current prices for the equipment mentioned?
7 Q-2,3,4,5,6,7,8,9,12

1 # 104
2 **VARIOUS**
3 ROBERT B. ASH
4 PROTECTIVE MATERIALS COMPANY
5863 MIAMI LAKES DRIVE
MIAMI LAKES, FLORIDA 33014
(305)-556-2440
5 Gives generalized answers and suggestions to many of the questions, including; walls, gates, blast-resistant shielding, vault and igloo door protection, etc.
6 What specifics can they give about some of the products mentioned?
7 Q-2,4,5,6,7,9,10,12

1 # 105
2 **VARIOUS**
3 PHILIP J. MAY
4 REMSA, INC.
(RESEARCH, ENGINEERING & MANAGEMENT SUPPORT)
P.O. BOX 189
HAMPTON, VA. 23669
(804)-723-0008
5 Gives brief generalized answers to several questions, including; EMP to disrupt enemy vehicles, Hazards of Electronic Radiation to Ordnance (HERO) to cause premature detonation of enemy fuzing devices, Balloons to carry road barriers, USAF Super Concrete, etc.
6 What specifics can be given?
7 Q-2,3,4,11,12

1 # 106
2 **VARIOUS**
3 KIRK A. MARCHLAND, P.E.
4 SOUTHWEST RESEARCH INSTITUTE
6220 CULEBRA ROAD
P.O. DRAWER 28510
SAN ANTONIO,TEXAS, USA 78228-0510
(512)-684-5111
5 Gives answers to many of the questions.
6 -
7 Q-2,3,4,5,6,7,9,10,11,12

1 # 107
2 **VARIOUS**
3 JON I. LUCAS
4 BATTELLE
505 KING AVENUE
COLUMBUS, OHIO 43201-2693
(614)-424-3794
5 Gives answers to many of the questions, including; walls, windows (Corning CHEMCOR glazing material), earth overburden (Portland Cement), 'King Tut' blocks, etc.
6 -
7 Q-2,4,7,8,9

1 # 108
2 **VARIOUS**
3 JOHN E. TROUT, P.E.
4 DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS, OMAHA DISTRICT
215 NORTH 17TH STREET
OMAHA, NEBRASKA 68102-4978
(402)-221-3151
5 Gives answers (or at least an attempted response) to all questions. Second section discusses problems with the survey in general and gives a possibly useful reference.
6 -
7 Q-(all)

1 # 109
2 **VARIOUS**
3 ANTHONY DIGREGORIO
4 SVERDRUP CORPORATION
1001 19TH STREET NORTH
SUITE 700
ARLINGTON, VA. 22209
(703)-351-4388
5 Gives answers some of the questions. Suggests value of 'revolutionary' new sensor systems to improve physical barriers.
6 -
7 Q-2,3,4,5,6,7,8,9,11,13

1 # **110**
2 **VARIOUS**
3 ROBERT J. SIMPSON
4 SIMPSON INSTALLATIONS LTD.
SECURITY HARDWARE
P.O. BOX 369
OXFORD, N.S. BOM 1PO
(902)-447-2954
5 Gives list of security related products available by this company; including doors, door frames, partitions, windows, etc.
6 What are the estimated delay factors of these products and how do they compare to products by other companies?
7 Q-2,4,6,8,9,12

1 # **111**
2 **VARIOUS**
3 JAMES R. SUDA
4 GEOMET TECHNOLOGIES, INC.
20251 CENTURY BOULEVARD
GERMANTOWN, MARYLAND 20874
(301)-428-3898
5 Gives concepts based on the general subjects listed in the questionnaire.
6 -
7 Indirectly answers Q-2,3,4,5,9,10,12

1 # **112**
2 **PANELS, ELECTRONIC LOCKS**
3 DONALD S. KOENIG
4 MOSLER INC.
1561 GRAND BOULEVARD
HAMILTON, OHIO 45012
(513)-867-4000
5 Briefly describes three products; lightweight modular panels, concrete panels, and an electronic combination lock.
6 -
7 Indirectly answers Q-4,5,8

1 # **113**
2 **STICKY FOAM, OVERBURDEN**
3 CHRISTOPHER J. GANNON
4 RETA
R.E. TIMM & ASSOCIATES, INC.
8330 SOUTH MADISON STREET
HINSDALE, ILLINOIS 60521
(708)-323-3211
5 Gives answers to questions regarding various methods of using sticky foam. Also talks about earth overburden for igloos.
6 -
7 Q-4,5,6,7,9,13